

PROJECT  
20007030

US EPA RECORDS CENTER REGION 5



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# SITE SAFETY PLAN

PRE-DESIGN SITE INVESTIGATION  
AMERICAN CHEMICAL SERVICE, INC.

GRIFFITH, INDIANA

FEBRUARY 1995

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*PREPARED FOR:*  
ACS RD/RA EXECUTIVE COMMITTEE  
*GRIFFITH, INDIANA*

• • •  
*PREPARED BY:*  
MONTGOMERY WATSON AMERICAS, INC.  
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MONTGOMERY WATSON

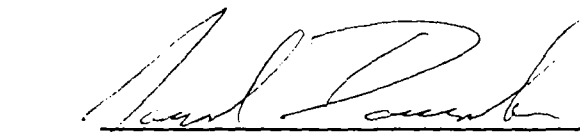
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Martin J. Hamper  
Project Manager

# SITE SAFETY PLAN (SSP)

## KEY PERSONNEL

Site Manager: David Pieczynski  
Alternate: Philip Smith

Site Safety Officer: David Pieczynski  
Alternate: Philip Smith

PROPOSED PROJECT START DATE  
FEBRUARY 1995

This Site Safety Plan does not supersede or in any way relieve subcontractors of their obligations under any applicable OSHA regulations including 29 CFR 1910: Occupational Safety and Health Standards and 29 CFR 1926: Health and Safety Regulations for Construction.

Montgomery Watson personnel working at this site meet the training and medical monitoring requirements of 29 CFR 1910.120: Hazardous Waste Operations and Emergency Response. Documentation of this training and medical surveillance can be obtained upon written request to Montgomery Watson, Corporate Health and Safety Manager.

The health and safety procedures set forth in this Site Safety Plan (SSP) are based on the site conditions and chemical hazards known or expected to be present using site data available at the time this SSP was written. This SSP is intended solely for the use of Montgomery Watson personnel during the activities described in this SSP. This SSP is subject to review and revision by Montgomery Watson's Corporate Health and Safety Manager (HSM) or designated alternate when it is deemed necessary by actual Site conditions encountered during the field activities.

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# INTRODUCTION

This Site Safety Plan provides guidelines and procedures necessary to protect the health and safety of Montgomery Watson personnel during field activities. Tasks to be completed include:

- Monitoring well installation
- Soil sampling
- Groundwater elevation measurement
- Groundwater sampling
- Geoprobe sampling
- Surface water sampling
- Sediment sampling
- Waste sampling
- Elevation and location survey
- Soil borings
- Drum Consolidation

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## KEY PERSONNEL, RESPONSIBILITIES AND TRAINING

### GENERAL

Training of Site personnel will conform with pertinent OSHA regulations including 29 CFR 1910.120. There will be a pre-project Safety Meeting, during which Site personnel will be supplied with a copy of the Health and Safety Plan. The Site Safety Officer (SSO) will discuss Site operations, and workers will be instructed in the recognition, avoidance and prevention of unsafe activities and conditions. Emergency practices and procedures will be reviewed.

The SSO has the authority and responsibility to change levels of protection in accordance with the guidelines of this document. In addition, the SSO and Health and Safety Manager (HSM) have authority to shutdown the operations should conditions warrant such action.

### PERSONNEL ROLES

#### **Project Manager (PM)**

The PM will be responsible for general oversight of project activities including the health and safety plan, providing for on-site inspection of plan compliance, and assigning a Site Safety Officer. He will also interface with the agency Project Coordinators.

#### **Health and Safety Manager (HSM)**

The HSM is responsible for maintaining proper medical surveillance (including pre-entry and exit examinations, if required), providing hazard communication information, training employees in safe operating procedures, and advising the PM on any matters concerning the health and safety of employees or the public. The HSM may be required to perform various types of area or personnel monitoring for purposes of determining worker exposure and proper selection of personal protective equipment if unforeseen chemical hazards are encountered. The HSM should be consulted when any changes in the recommended procedures or levels of protective equipment are made.

**Site Safety Officer (SSO)**

The Site Safety Officer (SSO) is responsible for field implementation of this SSP and enforcement of safety rules and regulations. The SSO will handle liaison with subcontractors on matters relating to health and safety. Other site-specific SSO functions include:

- Verify that utility clearance has been performed.
- Oversee day-to-day implementation of the SSP by subcontractor employees.
- Interact with subcontractor project personnel on health and safety matters.
- Determine levels of protection.
- Provide "refresher" training to new Montgomery Watson and subcontractor site personnel on health and safety matters.
- Verify that Montgomery Watson and subcontractor site personnel have received proper training and participate in a medical surveillance program.
- Inspect and maintain (daily) safety equipment which includes calibration of air monitoring instrumentation.
- Perform or direct ambient air quality monitoring as warranted.
- Modify SSP as needed and notify appropriate persons of changes.
- Investigate and report on-site accidents/incidents.
- If Montgomery Watson employees enter excavations, act as the competent person and ensure OSHA excavation requirements are enacted.
- Verify that Montgomery Watson and subcontractor site personnel are familiar with the hospital route, and that the route map is posted in the work trailer or site vehicles.
- Establish detailed procedures and routes for evacuation from the site.
- Establish the Exclusion, Decontamination and Support Zones at the site, as necessary, and provide means of securing the work area.
- Implement and direct confined space entry procedures if under the scope of work.

The SSO will hold initial startup and daily safety briefings with Montgomery Watson staff and subcontractors. The SSO will use the comprehensive and daily

checklists found in Appendix A when conducting the briefings.

The SSO will report accidents such as injury, overexposure, or property damage to the HSM, and will consult with the HSM on specific health and safety issues arising over the course of the project.

## **EMPLOYEE EDUCATION AND TRAINING**

Personnel activity involved in site activities must participate in routine health and safety education and training programs. These programs directed by the HSM are designed to provide employees with a thorough knowledge of hazardous materials, health and safety hazard potentials and compliance with federal OSHA 29 CFR 1910.120(e): 40-hours initial off site instruction, 24-hours on site supervised work, 8 hours annual review course, supervisor's additional 8-hours specialized training, and U.S. EPA requirements. The Health and Safety Training includes the following:

- General Safety Rules
- Basics of Chemistry
- Basics of Toxicology/Physiology
- Hazardous Materials (types/characteristics)
- Hazard Communication Information
- Respiratory Protection
- Respirator Training
- Chemical Protective Clothing
- Decontamination Procedures/Personal Hygiene
- Confined Space Work/Safety
- Atmospheric Testing/Sampling Procedures
- Emergency Response Procedures

The Montgomery Watson SSO will have received additional training related to specific responsibilities. This will include instruction (formal and informal) in the use of air monitoring equipment to be utilized on-site. In addition, the SSO will be certified and current in Red Cross first-aid and cardio-pulmonary resuscitation (CPR).

### **Health and Safety Plan Training**

An on-site "start-up" health and safety meeting and daily morning safety briefings will be held by the Montgomery Watson SSO. These meetings will include a discussion of the health and safety considerations for Site activities, and necessary protective equipment. Emergency procedures will be reviewed with Site personnel. The use, limitations, and inspection of air-purifying respirators will be discussed and proper personal and equipment decontamination procedures and protocols reviewed.

## **MEDICAL SURVEILLANCE PROGRAM**

Employees involved with this project work will participate in a medical surveillance program under the direction of an Occupational Physician. This program includes baseline, annual or bi-annual, and exit examinations. The typical annual or bi-annual physical examination protocol includes:

- Comprehensive Health and Exposure History
- Physical and Neurological Evaluation
- Chest X-ray
- Electrocardiogram
- Urinalysis
- Stool Occult Blood
- Blood Chemistry Profile
- Hematology Profile
- Pulmonary Function Testing
- Audiometry
- Vision Testing
- Blood Lead Level
- Lyme Disease

In addition, if there is evidence of exceptional occupational exposure, optional medical testing for heavy metals, RCB cholinesterase, serum PCB level, and reticulocyte count is performed with approval of the HSM.

Additionally, employees are evaluated to determine if they are physically able to perform work while using respiratory protective equipment, in compliance with 29 CFR Part 1910.

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## SITE DESCRIPTION/HAZARD SUMMARY

### SITE OVERVIEW

The ACS site is located at 420 South Colfax Avenue in Griffith, Indiana. The site includes the ACS property (19 acres), CSX (4 acres) and the Kapica/Pazmey area (2 acres) (Figure 2-1). There are five land disposal areas at the ACS site: On-Site Containment Area, Still Bottoms Area, Treatment Lagoons, Off-Site Containment Area and Kapica/Pazmey Area. The Griffith Municipal Landfill is located within the boundaries of the site, however, it is not a part of the Remedy at the site. The Griffith Municipal Landfill is an active solid waste disposal facility and has operated since the 1950s.

Based on information provided by American Chemical Service, Inc., the ACS facility began operation in May, 1955 as a solvent recovery facility. Solvent recovery remained the primary operation performed on-site though in the late 1960s, which the manufacture of small quantities of specialty chemicals began. These manufacturing operations included treating rope with fungicide, bromination and treating ski cable.

In 1961, ACS sold a two-acre parcel to John Kapica, and in 1962 Kapica began the operation of his drum reclaiming business at the location. Operations at Kapica Drum, Inc. consisted of drum reconditioning. Kapica Drum was sold to Pazmey Corporation in February 1980. Kapica/Pazmey operated from 1980 to 1987. The Pazmey Corporation was sold to Darija Djurovic in March 1987.

ACS' solvent operations involved spent solvent mixtures containing alcohols, ketones, esters, chlorinated solvents, aromatics, aliphatics, and glycols. In the early years of operation, spent solvents were stored in 55-gallon drums at various locations at the Site. Solvent recovery was performed in batch evaporation units, which were charged by pumping material directly from 55-gallon drums into the evaporation vessels. Still bottoms from the evaporation vessels were disposed in the Still Bottom Pond, prior to the installation of incinerators at the facility. ACS installed its first incinerator in 1966 and installed a second incinerator in 1969. The incinerators were used to burn still bottoms and non-reclaimable materials generated at the site, and wastes from off-site. The incinerator units were dismantled in 1977.

From 1970 to 1975, the spent solvents reclaimed at the Site were similar to those which were handled in the 1960s. However, an increasing percentage of shipments were received at the Site in bulk tanker trucks. In addition, the batch manufacturing processes were expanded during this period. A lard oil process which utilized tallow and animal rendering was used to manufacture a lubricant product. This process, along with a soldering flux operation, were discontinued prior to 1990. In 1971, the additive manufacturing area was built. Various detergents, lubricants, and chemical additives were manufactured, in addition to soldering flux, various amines, methanol, formaldehyde, sodium hydroxide, and maleic anhydride. An epoxidation plant was constructed in 1974 and a bromination operation using hexane was added in 1975. At various times up until 1990, the epoxidation plant used toluene or benzene as a reaction carrier.

Some time between 1975 and 1990, the solvent distillation units were replaced with new units though the types of solvent wastes reclaimed remained essentially the same. Spent solvent and reclaimed solvent recovery tank farms were constructed during this time period and the majority of the spent solvent waste streams were shipped in bulk tanker trucks, although drummed wastes were still processed. A hazardous waste drum unloading dock and storage area were built in the early 1970s, with spill containment curbing and a sump area added at a later date. In September, 1990 ACS lost its Resource Conservation and Recovery Act (RCRA) interim status, and hazardous waste operations ceased. Clean closure of hazardous waste units was accepted by the Indiana Department of Environmental Management in 1992 and ACS currently operates as a chemical production facility at the Site.

## **SCOPE OF WORK**

The Pre-Design Work Plan was prepared in response to the Unilateral Administrative (UAO) Order issued by the United States Environmental Protection Agency (U.S. EPA), Region V, on September 30, 1994, by Montgomery Watson Americas, Inc. (Montgomery Watson) on behalf of the Respondents. The purpose of the Pre-Design task is to develop additional data needed to prepare the Remedial Design for the site remedy.

The purpose of the groundwater contamination extent investigation is to determine the current extent of groundwater contamination. The extent of groundwater contamination was previously determined during the RI through a combination of permanent (i.e., monitoring wells) and temporary water sampling points (i.e., geoprobe-type sampling points). Because of the time that has past since the RI, an additional investigation is needed to determine the current extent of groundwater contamination related to the ACS NPL site.

The purpose of the Detection/Compliance Monitoring Program is to determine if the extent of the groundwater contamination changes during the period prior to the installation of the Perimeter Groundwater Containment System. After

installation of the Perimeter Groundwater Containment System, the Detection/Compliance Monitoring Program will be modified to monitor the effectiveness of the Perimeter Groundwater Containment System.

The purpose of the wetlands investigation is to provide additional delineation of potential contaminant impacts identified in the wetlands. The investigation will focus on conducting additional sampling in the vicinity of RI sampling locations west of the ACS plant and north of the On-Site Containment Area.

### **Well Installation**

Based on the results of field testing, additional wells will be installed to verify the extent of groundwater contamination. Based upon the available information, three Upper Aquifer wells are proposed at this time (MW25, MW26, and MW27). During the RI, the extent of the VOC plume was determined with a similar temporary sample location technique (i.e., the Tracer Investigation). The proposed wells would be located at the limits of this previously identified VOC plume. Additional wells may be proposed based upon the above described field investigation results.

The available water level data indicates that the six residential wells nearest to the site are located upgradient of the site. To complete the detection/compliance monitoring program, one additional Lower Aquifer well (MW28) is proposed to be located to the east of Colfax Road between the site and a group of six residential wells.

The Upper Aquifer wells will be installed with 10-ft screens at the top of the clay. The Lower Aquifer well will be double-cased through the Upper Aquifer and installed with a five-ft screen located five feet below the clay layer. The new wells will be sampled during the first Detection/Compliance Monitoring sampling round.

### **Residential Well Monitoring**

The goal of the residential well monitoring program is to determine if groundwater contamination from the ACS site is impacting residential drinking water. Samples collected during the RI did not detect contamination of residential drinking water, consistent with the RI groundwater monitoring well results. The Detection/Compliance Groundwater Monitoring System will be used to determine the need for the collection of samples from nearby residential wells, and to determine which wells will be sampled.

If sampling of residential wells is conducted, the samples will be analyzed for CLP Target VOC at DQO Level IV using the CLP Statement of Work according to the QAPP and FSP. The results will be provided to the U.S. EPA and the IDEM, who will be responsible for providing the results to the well owners/users.

Surface water samples will be collected from the drainage ditch that runs on the north and west of the wetlands and a tributary. One surface water sample will be collected at an upstream location and four in downstream locations and within

pooled water within the wetlands (i.e., the tributary). The upstream sample location will provide an indication of the quality of the surface water entering the ditch from offsite. Surface water samples from the ditch will provide an indication of the quality of the groundwater discharging to the wetlands, although such samples will also include potential effects from upstream influences and groundwater discharge from areas on the opposite site of the ditch from ACS. Samples will also be collected from standing water in the wetlands, if possible. Water samples of standing water in the wetlands would provide the best data to evaluate the potential impacts of groundwater discharge to the wetlands, and up to three such samples may be substituted for downstream ditch samples as conditions permit. Surface water samples will be analyzed for VOCs, SVOCs, PCBs, zinc, cadmium, lead, mercury, cyanide, and iron at Level IV DQO using CLP Statement of Work according to the AQPP and FSP.

## **CHEMICAL HAZARD SUMMARY**

### **Site Chemical Hazards**

**Substances of Concern** - A wide variety of potential substances of concern have been identified at the ACS Site. The following discussion highlights those chemicals, chemical groups, and materials which appear to pose the greatest health and safety concerns. These are discussed in relation to the matrix (i.e., soils, surface water, sediment, groundwater) in which they occur. All sample matrixes indicate contamination to some extent.

**Health and Safety Related to Substances of Concern** - Because the number of individual organic and inorganic chemicals and compounds is so extensive, it would be excessive to discuss each one individually. Therefore, they are discussed below as groups or classes.

**Polynuclear Aromatic Hydrocarbons (PAHs)** - This group includes a great number of chemical compounds which are common in our environment and vary widely in their potential impact on human health. Some of the most powerful carcinogens are PAHs. Most PAHs occur in the environment as complex mixtures which consist of both carcinogenic and non-carcinogenic PAHs. The toxic effect of PAHs through absorption (by way of inhalation, ingestion, or dermal contact) appears to be based on a high level of exposure over a relatively long time period.

**Halogenated Hydrocarbons** - These compounds are highly mobile, migrating easily through water, air, and soil. They are persistent in the underground environment, although they may degrade at the surface under the influent of ultra-violet light.

Halogenated hydrocarbons may act on the central nervous system, either as a stimulant or depressant. Mild exposure may cause such symptoms as dizziness, nausea, abdominal pain, and vomiting. In chronic (long-term) exposure, loss of weight and appetite may occur. Moderately severe exposure presents those



symptoms given above followed by severe irritability, convulsive seizures, and coma. Compounds from this class of chemicals detected at the site include:

**1,2-Dichloroethene** - a colorless, volatile liquid with a pleasant odor. Used as a solvent in perfumes, lacquers, thermoplastics, and organic synthesis. Produces drowsiness and effects the central nervous system.

**1,1,1-Trichloroethane (Methyl Chloroform)** - a clear, non-flammable liquid used primarily as a cleaning solvent. It may affect the gastrointestinal tract and the central nervous system. May cause anesthesia and death at high concentration (14,000-15,000 ppm). Lower concentration exposures, repeated daily, do not generally produce significant health effects.

**Trichloroethylene (TCE)** - a colorless, non-flammable liquid with a sweet odor like chloroform. Can be adsorbed through the skin. Inhalation and ingestion are also routes of exposure. Symptoms of exposure include headaches, dizziness, disturbed vision, nausea, vomiting, and eye irritation. Fatalities have occurred following severe, acute exposures. It has been known to cause cancer in laboratory animals.

**Vinyl Chloride** - an easily liquified gas with a faintly sweet odor. It may affect the central nervous system, liver, respiratory system and lymphatic system. It is a known carcinogen.

**Methylene Chloride** - as a pure produce, methylene chloride is a colorless liquid with a chloroform-like odor (pleasant to sweet odor). With a vapor pressure of 350 mm and a boiling point of 140°F, methylene chloride volatilizes at standard or elevated temperatures. Methylene chloride inhalation can induce narcosis, affect the central nervous system and blood, cause nausea, dermatitis, numbness or tingling of the extremities, and accelerated pulse rate. Skin contact may cause irritation of the skin and/or eyes. Exposure to high concentrations may produce vertigo and angina. Primary routes of exposure include inhalation, ingestion and skin or eye contact. Although methylene chloride has produced tumors and cancer in laboratory animals, it is currently not classifiable in reference to human carcinogenicity.

**Light Aromatic Hydrocarbons** - Compounds in this group are highly volatile, moderately soluble, biodegradable, and only slightly adsorbed on soils and sediments. Their presence at the surface is based on volatilization rates and biodegradation activities. In the groundwater environment, they are persistent and mobile. Exposure to these substances is primarily through vapor inhalation, although absorption through the skin may also readily occur. Acute exposure poses the primary health hazard of these substances. Low level exposure may result in irritability, excitability, muscle tremor, and headache. Some of the more notable light aromatic compounds which are present include ethyl benzene, xylene, and toluene.

**Benzene** - colorless, flammable liquid with aromatic odor, Benzene is classified as a human carcinogen.

**Ethylbenzene** - colorless, flammable liquid with aromatic odor. Explosive limits of 1% to 6.7% by volume in air. Toxicity is characterized by irritancy to skin and, to less extent, mucous membranes. Prolonged exposure may cause chest constriction leading to congestion of the brain and lungs with edema.

**Xylene** - clear, flammable liquid with aromatic hydrocarbon odor. Exposure symptoms include headache, eye irritation, fatigue, irritability, nausea, and anorexia. Chronic exposure may result in injury to heart, liver, and/or kidneys.

**Toluene** - flammable, colorless liquid with aromatic hydrocarbon odor. Explosive limits of 1.3% and 7.1% by volume in air. Prolonged exposure has acted as a mutagen in experimental animals.

**Phenol** - Phenol is a solid or liquid with sweet tarry odor similar to railroad ties. Explosive limits 1.7% to 8.6% by volume in air. Exposure symptoms will burn eyes and skin and it acts as a poison on the central nervous system. The analgesic action may cause loss of pain sensation. Prolonged exposure has acted as a carcinogen and mutagen in experimental animals.

**PCBs** - These compounds are readily absorbed through the skin and permeate most protective clothing within a relatively short time period. Exposure to PCBs may cause chloracne (a reddish eruption of the skin), irritation of the respiratory system, and liver damage. PCBs have been shown to cause birth defects in developing fetuses and are suspected of carcinogenic activity. The members of this group have low vapor pressures and thus do not volatilize quickly. The greatest threat of exposure comes from direct contact with contaminated soils and waters, or by inhalation of contaminated dusts or aerosols.

**Heavy Metals** - Heavy metals may become absorbed onto soil particles and therefore are of concern if dry, dusty conditions prevail. Chronic overexposure may cause brain damage, gastrointestinal disturbances, anemia, and kidney damage.

Ingestion or inhalation of chromium may lead to histologic fibrosis of the lungs. This element is also a suspected carcinogen. Chromium poses a potential health risk by inhalation, ingestion, or skin absorption. Exposure to chromium may cause an allergic type reaction producing dermatitis or lung irritation. Symptoms of exposure may include coughing, wheezing, headaches, difficult breathing, and fever. The skin may become red, inflamed, itch, and ulceration may occur.

Nickel and soluble nickel compounds are capable of producing sensitization dermatitis and/or allergic asthma in certain individuals. Furthermore, inhalation

of many nickel compounds via their presence on airborne dusts can produce severe irritation of the nasal cavities and pneumonitis. Some of these compounds have been proved to be cancer producing in humans via inhalation. Care should be taken to prevent any skin contact with and/or inhalation of dusts containing such compounds.

Cadmium compounds are possible human carcinogens with high oral and inhalation toxicities. The inhalation of dusts containing such compounds primarily affects the respiratory tract, but the kidneys and liver may also be affected with exposures to high concentrations. Possible symptoms of exposure include pulmonary edema, dryness of the throat, cough, headache, shortness of breath, and vomiting. More severe exposures result in marked lung changes, persistent cough, pain in chest, severe dyspnea, prostration with possible fatal results. Ingestion of cadmium compounds may result in sudden nausea, salivation, vomiting, diarrhea, and abdominal pain and discomfort.

**Cyanide** - Most cyanide compounds and hydrogen cyanide (HCN) gas can be readily absorbed through the skin. Inhalation of HCN or dust of cyanide compounds and ingestion of cyanide compounds are also a route of entry. Skin absorption is accelerated by sweating and the presence of open wounds. Once cyanide has entered the body, it acts as a very rapid acting blood poison interrupting the transport of oxygen.

Cyanide and cyanide compounds are mainly of concern in regard to the respiratory dangers they present. Hydrogen cyanide gas and volatile cyanides are all highly toxic by brief, high level exposures and can cause death. Cyanide is a noncumulative poison, and therefore chronic toxicity is not a major concern. Acute exposure to hydrogen cyanide may result in symptoms such as a headache, weakness, changes in taste and smell, irritation of throat, vomiting, difficulty breathing, abdominal colic, and nervous instability. Hydrogen cyanide has the characteristic faint odor of bitter almond.

MSDS for representative compounds are presented as Appendix B.

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## SITE BOUNDARIES AND ENTRANCE/EXIT

### **SITE AND PROJECT BOUNDARIES**

See Appendix C which contains a map of the site indicating boundaries of the site and project activity locations.

### **PRESENT SITE SECURITY**

The ACS manufacturing plant is enclosed within a chain link fence. Prior to starting site activities, Montgomery Watson personnel should check-in with Jim Murphy at the ACS office. Fencing is present around the landfill portion of the site and around the ACS facility which should prevent the exposure of unauthorized, unprotected people at the site.

### **SITE SECURITY UPGRADES NEEDED**

At a minimum, all areas not already fenced will be marked with yellow caution tape to prevent unauthorized entry into the work area. The SSO will ensure that security measures are adequate to protect the general public from hazards associated with operations. Security will be maintained by verbal commands. No unauthorized individuals are allowed within 20 feet of operations.

Work zones in and around the Site will be defined by the SSO prior to the initiation of Site activities. If deemed necessary, the overall work site will be delineated into Exclusion, Decontamination, and Support Zones. The areas of active work plus a buffer zone will comprise the Exclusion Zone during operations at the Site. The size of this buffer zone is to be determined in the field by the SSO. Each zone will be clearly defined with physical demarcation devices in accordance

with prudent practices and applicable guidelines. Only personnel actively involved in project work will enter these areas during operations.

### **Exclusion Zone**

The Exclusion Zone defines the area where contamination is known to exist or potentially exists. Personnel entering the Exclusion Zone must wear prescribed Levels of Protection. An entry and exit check point will be established at the periphery of the Exclusion Zone to regulate the flow of personnel and equipment in and out of the zone, and to verify that entry and exit procedures are followed.

The outer boundary of the Exclusion Zone may need to be delineated (at least in part) by a "hotline", consisting of survey stakes and flagging. This will delineate specifically identified "high hazard" areas such as leachate seeps, drainage, spills, hazardous work areas (e.g., drilling locations or test pit locations), etc.. Factors which will be considered in positioning the "hotline" include the distances needed to prevent fire or an explosion from affecting personnel outside the zone, the physical area necessary to conduct Site operations, and the potential for airborne dispersal of contaminants from the area. The "hotline" may be modified and adjusted during operations, as more information becomes available.

Based on current information, a site-wide Exclusion Zone is not warranted, and thus will not be established at the Site. Exclusion Zones will be established at any identified "high hazard" areas. Otherwise, Exclusion Zones will generally be restricted to drilling operations and test pit excavations, encompassing an approximate twenty-meter radius outward from these areas, whenever location permits.

### **Decontamination Zone**

The Decontamination Zone includes the area immediately surrounding the Exclusion Zone. This zone lies at the interface of the Exclusion Zone and the Support Zone, and provides for the decontamination of equipment and personnel before crossing into the Support Zone. Contaminated protective equipment, such as respirators, hoses, boots, etc., shall not be removed from the Decontamination Zone. The Decontamination Zone serves as a buffer to further reduce the probability of the clean area (Support Zone) becoming contaminated or being affected by other existing hazards.

### **Support Zone**

The Support Zone covers all areas which lie both outside of the Decontamination Zone and within the Site boundary. This area is considered to have no significant air, water, or soil contamination, and therefore presents no potential hazard to on-site personnel. The Support Zone provides an area for the performance of on-site, non-hazardous activities and acts as a staging area for personnel entering the Decontamination and Exclusion Zones.

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# 4

## GENERAL SITE HEALTH AND SAFETY CONSIDERATIONS

### WEATHER CONDITION RESTRICTIONS

The Site Safety Officer (SSO) has the authority, should severe weather threaten, to place site activities on standby, cease operations and/or evacuate the Site as deemed necessary.

Weather conditions on Site can not be controlled. Site personnel are to be aware of the warnings of impending severe weather and the precautions that are to be taken when severe weather threatens. Refer to the SOP for Severe Weather found in Appendix D.

### TEMPERATURE STRESS

Hot or cold weather is generally a consideration at any site and can not be controlled. Site workers need to be aware of engineering controls which can reduce temperature stress, the signs and symptoms of temperatures stress and first aid measures for victims of temperature stress. Refer to the SOP for Temperature Stress found in Appendix E.

### GENERAL SITE HEALTH AND SAFETY RULES

Some general safe work practices apply to all sites. Refer to the SOP for General Site Health and Safety Rules found in Appendix F.

## **HEAVY EQUIPMENT**

Special safety procedures are required when working around operating heavy equipment. Heavy equipment includes, backhoes, scrapers, loaders, bulldozers, trucks and drill rigs. Hazards associated with operating heavy equipment include obstructed view, moving parts, rollover, overhead clearance, noise and dust.

- Heavy equipment should be operated by trained, authorized personnel.
- Equipment should be inspected daily.
- Equipment should be equipped with backing alarms and if driven over uneven terrain rollover protection and seat belts.
- Personnel working on the equipment or in the area should wear safety glasses with side shields, steel-toe steel-shank safety boots, and hard hats.
- A spotter should be used when backing up to avoid blind spots.
- All guards should be in place and safety switches should be operational.
- Drill rigs and other equipment with tall booms should, at a minimum, remain at least 10 ft from overhead power lines and should not be moved with the boom raised.

## **TRAFFIC**

If personnel will be in a roadway or within 10 ft of a roadway during work activities, orange safety vests must be worn. Barricades and warning signs and/or cones may be required. The SSO will determine if additional measures are warranted and will implement necessary control measures. Follow the procedures in Appendix F - General Site Health and Safety Rules.

## **BIOLOGICAL HAZARDS**

There is a potential for additional hazards at the site which include biological hazards.

- Biological - Occupationally induced infection can occur in any occupation as a result of exposure to bacteria, viruses, fungi, or parasites. A simple laceration from a sharp edge can become secondarily infected with staphylococci or streptococci. A thorn, a wood splinter, or a metal slug acting as a foreign body can pave the way for secondary infection of the skin. Cuts, scrapes, or other lacerations should be cleaned, disinfected,

and dressed immediately following standard first aid procedures.

- **Plants** - A broad variety of plants and wood cause injury to skin through primary irritation or allergic sensitization. Although the chemical identity of many plant toxins has not been established, it is well known that an irritant or allergenic agent can be present in the leaves, stems, flowers, bark, and other components of the plant. Examples include, poison ivy and sumac. Personnel will be wearing long pants at the site. If work is to be performed in areas with poison ivy or sumac, contact with the plant should be avoided. The SSO will identify locations where poisonous plants are present during daily site briefings. Personnel may need to wear gloves or chemical resistant clothing (Tyvek). If contact is made with poison plants, remove contaminated clothing, wash all exposed areas with soap and water followed by rubbing alcohol. Apply calamine or other soothing skin location. Seek medical advice if severe reaction occurs.
- **Insects** - Insect bites and stings can be serious to hypersensitive persons and even deadly depending on the type of insect. Examples include bees, wasps, hornets, brown recluse spiders, and ticks. Lyme disease is a tick-borne disease and starts out with flu-like symptoms but may lead to arthritis and serious nerve and heart damage. Avoid tall grassy areas or other areas of thick vegetation. If work is performed in these areas, personnel should wear light colored clothing, tape pant's cuffs around their ankles, use a commercially available repellent and check for ticks regularly.
- **Animals** - Animal bites are a concern because of the potential for the animal to carry the rabies virus, which attacks the nervous system. If an animal bit occurs the victim must be taken to the nearest medical facility immediately.

## **EXCAVATIONS**

Excavations are not anticipated to be present at the site. If open excavations are encountered personnel will refrain from entering them.

## **UTILITIES**

All utilities must be cleared before performing any intrusive activities. The SSO will verify that utilities have been cleared before work begins at the site.



## NOISE

Hearing protection is required when working in close proximity to heavy equipment, the level of noise interferes with communications or the sound level exceeds 85 dB. Generally, if you cannot hear someone speaking at a normal conversational level when they are 3 ft from you, you need hearing protection.

**Hearing protection is required within 50 ft of the following operations:**

- Driving casing or the split spoon sampler
- During core drilling
- Use of power tools
- Use of air compressor
- Use of other machinery

## CONFINED SPACES

Confined space entry is not allowed under the scope of this SSP. Should a confined space entry situation be encountered, the Health and Safety Manager must be notified and provisions for confined space entry must be added to this SSP.

## FALL HAZARDS

If work is performed on an elevated level six (6) feet above the ground or work surface, fall protection is required. Fall protection may still be necessary for heights less than six feet in certain situation if there is a potential for injury from falls at lower heights. These may include falls onto protruding rebar or other sharp objects. The SSO will be responsible for implementing the fall protection program as outlined in Appendix F - General Site Health and Safety Rules. Ladders also pose a significant hazard associated with falls. The guidelines in Appendix F should also be used if ladders are present at the site.

## **WATER HAZARDS**

Workers working near water, where a danger of drowning exists, will wear U.S. Coast Guard approved life jackets. The SSO will inspect life jackets before and after each use. Defective life jackets will be taken out of service and destroyed. When working from boats or barges ring buoys with at least 90 feet of line will be available for emergency rescue. A lifesaving skiff will be available when working from barges for rescue purposes.

## **ELECTRICAL HAZARDS**

### **Electrical Cords**

Electrical cords passing through work areas should be covered or elevated to protect the cord from damage and reduce hazards to employees.

Extension cords used with portable tools will be 3-wire type and will be protected from damage when in use. Extension cords must be inspected on a routine basis. Cords with cuts in the insulation or that are worn or frayed or have insulation pulled back from the plug or receptacle fittings will be taken out of service immediately.

### **Grounding**

Portable tools and other electric equipment will be grounded or double insulated. Ground fault circuit interrupters (GFCIs) will be used in wet areas and on all field sites and outdoor operations if power is supplied through the utilities. GFCI's are not required on portable generators rated less than 5kW which are single phase, two wire type.

## **HOT WORK**

Hot work involves the use of open flames or other sources of heat around possible sources of flammable vapors. Hot work is not permitted under the scope of this SSP. The SSO will be responsible for fire control measures as outlined in Appendix F - General Site Health and Safety Rules.

## **LIFTING/MATERIALS HANDLING**

Lifting and materials handling are hazards during operations. Follow the procedures outlined in Appendix F - General Site Health and Safety Rules when lifting objects or handling materials.

# 5

## CHEMICAL HAZARD EVALUATION/ AIR MONITORING STRATEGY

The following air quality parameters will be monitored during work activities:

- Oxygen Level
- Combustible Gases
- Hydrogen Sulfide
- Hydrogen Cyanide
- Vinyl Chloride
- Volatile Organic Compounds (VOCs)
- Other Compounds

MSDS equivalents for specific compounds noted above are included in Appendix B.

### AIR MONITORING STRATEGY

#### **Oxygen**

A direct reading oxygen meter will be used to determine the percent of oxygen in the atmosphere.

**Instrument Reading****Action to be Taken**

&lt;19.5% or &gt;23.5%

Cease operations and move to a safe area. Re-evaluate the work plan. Engineering controls such as forced ventilation and use of non-sparking tools are to be implemented if operations are to continue. **DO NOT CONTINUE WORKING UNTIL OXYGEN LEVELS ARE BETWEEN 19.5 AND 23.5%.** When oxygen levels are outside this range, combustible gas meter readings are not reliable.

**Combustible Gases**

Action levels are based on the readings of a combustible gas meter. The readings are generally given as a percentage of the lower explosion limit (% LEL).

**Instrument Reading****Action to be Taken**

0 to 10% LEL

Continue working and monitoring the atmosphere for combustible gases. Inform personnel working in the area whenever readings are >5% LEL.

10 to 20% LEL

Continue working with caution. Inform personnel working in the area of the readings. Be prepared to cease operations.

&gt; 20% LEL

Cease operations and move to a safe area. Re-evaluate the work plan. Engineering controls such as forced ventilation and use of non-sparking tools are to be implemented if operations are to continue. **DO NOT CONTINUE WORKING UNTIL CONDITIONS ARE CONSISTENTLY BELOW 20% LEL.**

**NOTE**

When oxygen levels are above 23.5% or below 19.5%, combustible gas meter readings are not reliable.

**Hydrogen Sulfide (H<sub>2</sub>S)**

A direct reading H<sub>2</sub>S meter will be used to determine H<sub>2</sub>S levels. Whenever the alarm sounds on the H<sub>2</sub>S meter, cease work immediately and contact the SSO or HSM. For H<sub>2</sub>S the TLV is 10 PPM, and the alarm is set for 10 PPM.

If approval is given by the SSO or HSM, verification of the presence of H<sub>2</sub>S is to be made using colorimetric tubes which can detect H<sub>2</sub>S. The person taking the sample is to wear appropriate respiratory protection. There is no air-purifying cartridge approved for use in an atmosphere containing H<sub>2</sub>S. A supplied-air respirator must be used.

If the presence of H<sub>2</sub>S is confirmed, cease activities and contact the HSM. If the colorimetric tubes do not indicate the presence of H<sub>2</sub>S, continue with site activities cautiously and continue to monitor for H<sub>2</sub>S with the direct reading meter.

### **Hydrogen Cyanide (HCN)**

A direct reading HCN meter will be used to determine HCN levels. Whenever there is any positive reading on the HCN meter, cease work immediately and contact the Site Safety Officer (SSO) or Health and Safety Manager (HSM). The TLV-C (ceiling) for HCN is 4.7 PPM, and the alarm is set for 4 PPM.

If approval is given by the SSO or HSM, verification of the presence of HCN is to be made using colorimetric tubes which can detect HCN. The person taking the sample is to wear appropriate respiratory protection. There is no air-purifying cartridge approved for use in an atmosphere containing HCN. A supplied-air respirator must be used.

If the presence of HCN is confirmed, cease activities and contact the HSM. If the colorimetric tubes do not indicate the presence of HCN, continue with site activities cautiously and continue to monitor for HCN with the direct reading meter.

### **Vinyl Chloride**

Whenever any reading above background is noted with the organic vapor monitor, colorimetric tubes will be used to verify the presence of vinyl chloride. If vinyl chloride is found to be present above 1 ppm, personnel will cease operations and contact the Health and Safety Manager. There is no air-purifying cartridge approved for use in an atmosphere containing vinyl chloride. A supplied-air respirator must be used.

## **Volatile Organic Compounds (VOCS)**

Photoionization meter with a lamp rating of 11.7 eV

### **Action Levels:**

< Background: Level D or D-Modified\*

< 5 Instrument Units above background: Level C

5 to 50 Instrument Units above background: Level B

$\geq$  50 Instrument Units above background: Cease operations and move to a safe area. Contact the Health and Safety Manager and re-evaluate the work plan.

- \* Level D is to be used when there is no dermal contact with contaminated materials. Level D-Modified is to be used when there is dermal contact with contaminated materials.

## **Dust**

A dust control program will be used to limit contaminant dispersion. Prevailing winds are generally westerly, but stakes with flagging will be used to determine wind direction and aid in dust control measures.

Dust may be generated during the following activities.

- Movement of vehicles on unpaved roads.
- Movement of soils by bulldozers, backhoes, and front end loaders.
- Wind erosion from stockpiled soils

Dust control measures will be implemented during construction activities on site. Specific dust control measures will be chosen by the subcontractor performing the work and may include the following:

- Compacting unpaved roads as much as possible.
- Watering the roads with a water wagon or spray bar. Materials sprayed may include plain water, salt solutions, surfactants, and/or adhesives.
- Speed control of vehicles using the road.

- Control of emissions from movement of soil by bulldozers, front end loaders, and backhoes (with such a high water table most soil excavated will be very moist and additional measures are not likely necessary).
- Control emissions from soil stockpiles by covering the soil pile or erecting a wind screen, and/or spray the pile with water or chemical dust suppressants to compact and weight soil particles.

If visible dusty conditions persist after dust control measures are implemented, the SSO will initiate and upgrade to Level C protection.

## **FREQUENCY**

Perform air monitoring whenever any of the following situations arise:

- Upon initial entry to a site to rule out IDLH conditions
- Work begins at a different portion of the site
- New contaminants are noted
- A new/different phase of work is started
- Work is being performed in areas with obvious liquid contamination
- Intrusive activities
- Continuously during confined space entry

Monitoring should be performed on personnel with the highest potential exposure. If samples are being collected in jars, use monitoring equipment to determine the level of contaminants in the breathing zone of the person collecting the samples. Do not use instantaneous readings to determine the level of protection. Readings should be persistent unless "pulses" of vapor exceed STEL or Ceiling levels. Monitoring should also be performed at the source of chemical hazards such as boreholes and the surface of contaminated materials but upgrades are based on breathing zone concentrations.

## **CALIBRATION REQUIREMENTS**

Calibrate all monitoring equipment at the beginning and end of each work day.

Calibration data will be recorded in a bound field notebook or in the field notes. Documentation should include:

- Date/time
- Zero reading before calibration
- Concentration of calibration gas
- Reading obtained with calibration gas before adjusting span
- Final reading obtained with calibration gas after adjusting span

When air monitoring is required, take area air samples at the following locations daily. Record time, location and results of monitoring and actions taken based upon the readings:

- Upwind of work areas to establish background air contaminants
- In Support Zone to check for contamination
- Along decontamination line to check that decontamination workers are properly protected and on-site workers are not removing protective equipment in a contaminated area
- Exclusion Zone to verify level of protection and Exclusion Zone boundaries
- Downwind of work area to track any contaminants leaving site

Use the SOPs for equipment calibration in the Montgomery Watson Instrument SOP Manual.

## **REQUIRED PERSONAL PROTECTIVE EQUIPMENT**

### **Level D**

Level D is to be worn during activities which do not suggest any initial respiratory or dermal health hazards. The following list outlines the personal protective equipment to be utilized for Level D.

- Work Uniform
- Safety Boots - Steel toe/steel shank
- Hard Hat
- Safety Glasses with side shields\*
- Face Shield\*
- Hearing Protection\*



### **Level D-Modified**

Level D-Modified is to be worn during activities which do not suggest any respiratory hazards, but where dermal protection is warranted.

- Safety Boots - Steel toe/steel shank
- Hard Hat
- Safety Glasses with side shields\*
- Face Shield\*
- Hearing Protection\*
- Outer Gloves - MOC:Neoprene or Nitrile
- Boot Covers - MOC:Latex
- Chemical Resistant Clothing - MOC:Polyethylene-coated Tyvek
- Inner Gloves - MOC:Nitrile

### **Level C**

Level C should be worn where the criteria for using air-purifying respirators are met, and a higher level of dermal protection is needed. Criteria for using an air purifying respirator include chemicals with good warning properties, oxygen between 19.5 and 23.5% and a chemical cartridge must be available for chemicals in question.

- Safety Boots - Steel toe/steel shank
- Hard Hat
- Face Shield\*
- Hearing Protection\*
- Outer Gloves - MOC:Neoprene or Nitrile
- Boot Covers - MOC:Latex
- Chemical Resistant Clothing - MOC:Hooded, Polyethylene-coated Tyvek
- Full-Face Air Purifying Respirator
- Respirator Cartridge - Type:organic vapor/acid gas
- Inner Gloves - MOC:Nitrile

### **Level B**

Level B is worn where the highest level of respirating protection is needed and a higher level of dermal protection is required. Level B is the primary level of choice in unknown environments.

- Safety Boots - Steel toe/steel shank
- Hard Hat
- Face Shield\*
- Hearing Protection\*
- Outer Gloves - MOC:Neoprene or Nitrile
- Boot Covers - MOC:Latex
- Chemical Resistant Clothing - MOC:Hooded, Polyethylene-coated Tyvek
- Positive Pressure/Pressure Demand Self Contained Breathing Apparatus or Airline Respirator with Escape Bottle
- Inner Gloves - MOC:Nitrile

\* Optional PPE - Use as needed.

Note: Safety glasses are required within 50 ft of operating equipment, tools or machinery. Face shields are required during operations that may cause materials to fly into or spray the face. These include:

- Sawing metal or concrete
- Grinding or sanding operations
- In the vicinity of drilling operations when mud and liquids are sprayed in the work area
- When opening drums or tanks when hazardous materials under pressure are potentially present
- Cutting with a torch or when welding

### **TASK SPECIFIC LEVELS OF PROTECTION**

#### **Monitoring Well Installation/Soil Sampling/Sediment Sampling/Soil Borings**

Potential Hazards: VOCs, severe weather, temperature stress, heavy equipment, biological hazards, utilities, and noise.

Hazard Evaluation: Low to moderate.

Principle Route of Chemical Exposure: Dermal contact and inhalation.

Level of Protection: Level D with upgrades to Level D-Modified, Level C or Level B.

Air Monitoring: Organic vapors, vinyl chloride.

#### **Groundwater Sampling/Groundwater Elevation Measurement/Surface Water Sampling**

Potential Hazards: VOCs, severe weather, temperature stress, and biological hazards.

Hazard Evaluation: Low

Principle Route of Chemical Exposure: Dermal contact and inhalation.

Level of Protection: Level D with upgrade to Level D-Modified.

Air Monitoring: None required.

**Geoprobe Sampling**

Potential Hazards: Explosive vapors, VOCs, hydrogen sulfide, hydrogen cyanide, severe weather, temperature stress, heavy equipment, biological hazards, utilities, and noise.

Hazard Evaluation: Low to moderate.

Principle Route of Chemical Exposure: Inhalation, dermal contact.

Level of Protection: Level D with upgrade to Level D-Modified, C or B.

Air Monitoring: Oxygen, explosive vapors, organic vapors, vinyl chloride, hydrogen sulfide, hydrogen cyanide in fill areas. Organic vapors and vinyl chloride only outside fill area.

**Drum Consolidation/Waste Sampling**

Potential Hazards: Explosive vapors, VOCs, hydrogen sulfide, hydrogen cyanide, severe weather, temperature stress, heavy equipment, biological hazards, noise.

Hazard Evaluation: Moderate to high.

Principle Route of Chemical Exposure: Dermal contact and inhalation.

Level of Protection: Level C

Air Monitoring: Oxygen, explosive vapors, organic vapors, vinyl chloride, hydrogen sulfide, hydrogen cyanide.

Special Work Practices: See the drum handling procedure at the end of this section.

**Elevation and Location Survey**

Potential hazards: Severe weather, temperature stress and biological hazards.

Hazard Evaluation: Low

Principle Route of Chemical Exposure: Dermal contact.

Level of Protection: Level D

Air Monitoring: None required.

**DRUM HAZARDS**

Drum handling operations at the site involve consolidation of waste cuttings and decontamination solutions collected during previous site activities. Ignition sources will be removed from the work area and a 10 lb ABC fire extinguisher will be stationed within 20 ft of the operation. Personnel will also have a portable eyewash station present near the work area.

**INSPECTION**

The first step in handling drums is to determine their condition and possible contents. Look for:

- Signs of deterioration such as corrosion, rust, and leaks.
- Signs that the drum is under pressure such as swelling and bulging.

Conditions in the immediate vicinity of the drums may provide information about drum contents and their associated hazards. Monitoring should be conducted around the drums.

**Preliminary Characterization**

- Leaking/deteriorated
- Bulging
- Explosive/shock-sensitive

The following procedures can be used to maximize worker safety during drum handling and movement:

- Have overpacks ready before any attempt is made to move drums.
- Before moving anything, determine the most appropriate sequence in which the various drums and other containers should be moved. For example, small containers may have to be removed first to permit heavy equipment to enter and move the drums.
- Exercise extreme caution in handling drums that are not intact and tightly sealed.
- Ensure that operators have a clear view of the roadway when carrying drums. When necessary, have ground workers available to guide the operator's motion.

#### **Drums That May Contain Explosive or Shock-Sensitive Waste**

- If a drum is suspected to contain explosive or shock-sensitive waste as determined by visual inspection, seek specialized assistance before any handling.
- If handling is necessary, handle these drums with extreme caution.
- Prior to handling these drums, make sure all non-essential personnel have moved a safe distance away.
- Use a grappler unit constructed for explosive containment for initial handling of such drums.

#### **Bulging Drums**

- Pressurized drums are extremely hazardous. Wherever possible, do not move drums that may be under internal pressure, as evidenced by bulging or swelling.
- If a pressurized drum has to be moved, whenever possible handle the drum with a grappler unit constructed for explosive containment. Either move the bulged drum only as far as necessary to allow seating on firm ground, or carefully overpack the drum. Exercise extreme caution when working with or adjacent to potentially pressurized drums.

## OPENING

- Monitor continuously during opening. Place sensors of monitoring equipment, such as colorimetric tubes, dosimeters, explosion meters, organic vapor analyzers, and oxygen meters, as close as possible to the source of contaminants, i.e., at the drum opening.
- If the drum shows signs of swelling or bulging, perform all steps slowly. Relieve excess pressure prior to opening and, if possible, from a remote location using such devices as a pneumatic impact wrench or hydraulic penetration device. If pressure must be relieved manually, place a barrier such as explosion-resistant plastic sheeting between the worker and bung to deflect any gas, liquid, or solids which may be expelled as the bung is loosened.

### Sampling

Drum sampling can be one of the most hazardous activities to worker safety and health because it often involves direct contact with unidentified wastes.

When manually sampling from a drum, use the following techniques:

- Keep sampling personnel at a safe distance while drums are being opened. Sample only after opening operations are complete.
- Do not lean over other drums to reach the drum being sampled.
- Cover drum tops with plastic sheeting or other suitable noncontaminated materials to avoid excessive contact with the drum tops.
- Never stand on drums. This is extremely dangerous. Use mobile steps or another platform to achieve the height necessary to safely sample from the drums.
- Obtain samples with either glass rods or vacuum pumps.

## PERSONAL DECONTAMINATION

Use the SOP for Decontamination at the highest level of protection used on Site each day, found in Appendix G.

## **EQUIPMENT DECONTAMINATION**

Decontamination of all heavy equipment will be performed at a designated area. Decontamination will involve a high-pressure steam-cleaning of all equipment which will come in contact with subsurface material. Additional scrubbing may be required to remove encrusted materials. Decontamination of heavy equipment will occur between boreholes, as well as at the completion of such equipment's use on Site.

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# 6

## INVESTIGATION DERIVED MATERIALS DISPOSAL

### DISPOSABLE CLOTHING/EQUIPMENT

Drum and label the materials and leave on-site.

### DRILL CUTTINGS

Drill cuttings will be screened with a photoionization detector (PID) and retained in 55-gallon drums on-site. Drums will be labeled as needed to identify contents and source locations. Cuttings will be disposed of in accordance with state and federal regulations.

### DRILLING/DECONTAMINATION/PURGE WATER

Water generated during drilling operations, well purge water, and decontamination solutions will be screened with a photoionization detector (PID), and retained in 55-gallon drums on-site. Drums will be labeled to identify contents and well locations if applicable. Drum contents will be disposed of in accordance with state and federal regulations.

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## EMERGENCY INFORMATION

	<u>Address</u>	<u>Telephone or Mobil*</u>	<u>Contact Person</u>
Ambulance	_____	911 or *999	_____
Hospital E/R	Munster Community Hosp. 901 McArthur Boulevard Munster, Indiana	(219) 836-1600	_____
Poison Control	_____	(800) 942-5969	_____
Police	_____	911 or *999	_____
Fire	_____	911 or *999	_____
Client	_____	(219)	_____
EPA/other agency	U.S. EPA	(312) 353-2318	_____
Utilities	_____	(800) 382-5544	_____
Chemtrec	_____	(800) 424-9300	_____

Spill Response \_\_\_\_\_

\*Note: when using a mobile telephone, \*999 only works on state highways, otherwise dial "0" for operator assistance to direct you to the appropriate emergency service.

<u>Emergency Contacts</u>	<u>Name</u>	<u>Business Phone</u>	<u>Home Phone</u>
Project Manager	Martin Hamper	(708) 691-5065	(312) 284-7332
Site Manager	David Pieczynski	(708) 691-5069	(708) 372-0346
H&S Coordinator	David Pieczynski	(708) 691-5069	(708) 372-0346
H&S Manager	Erik Goplin	(608) 231-4747	(608) 437-4879

## **EMERGENCY ROUTES**

See Appendix C for a map showing the route to the hospital/clinic.

### **Driving Directions**

Exit site onto Colfax north to Main Street. Take left onto Main, head west to Indianapolis Boulevard (Route 41). Take right onto 41 (north) to Ridge Road. Take left onto Ridge Road (west) to Calumet Avenue. Turn left onto Calumet Avenue (south). Hospital emergency entrance is on east side of street, just past Fisher Street.

Emergency routes are to be verified by the SSO and communicated to site personnel prior to site activities.

## **EMERGENCY PROCEDURES**

### **On-site Communication System**

On-Site communication procedures will be established in the field during the initial Site briefing or whenever there is a change of Site personnel. Emergency signals will be designated and discussed during this initial briefing. Employees will be made aware of routes of egress and assembly points to be used in the event of an emergency. A telephone will be accessible to Site personnel during project field activities defined under the scope of work. In addition, vehicle horns or other means will be used to notify personnel of on Site emergency situations. Communication in the event of a Site emergency will be determined by the SSO. Personnel will leave the Site by the most expeditious route and will assemble at a location designated by the SSO in the initial Site health and safety briefing.

### **Work Site Emergency Procedures**

In the event of a medical emergency at a work site, personnel will act quickly and reasonably to remedy the situation. The SSO shall give directions as to how to proceed. If the SSO is incapacitated by an injury, etc., an appropriate local emergency response agency will be contacted. See Appendix H of this Health and Safety Plan for the Emergency Response SOP.

Special care will be taken if rescue efforts are necessary. Personnel shall utilize extreme caution and take steps to be as adequately protected as possible, before attempting such rescue.

### **Emergency Equipment**

The following emergency equipment shall be maintained at the contamination reduction zone or in the operations vehicle:

- Fire Extinguisher
- Portable Eyewash
- First-Aid Kit

- 5 Gallons of Fresh Water (for flushing of skin, general washing)

### **Other Emergency Procedures**

- Name, address, and telephone number of the nearest medical treatment facility will be conspicuously posted. A map and directions for locating the medical facility will be readily available.
- Telephone numbers and procedures for obtaining ambulance, emergency, fire, and police services will be conspicuously posted.
- An emergency eye wash fountain and First Aid equipment shall be readily available on Site.
- The SSO will inform the local medical facility before site operations commence. The SSO will give the medical facility general information of on-site chemical hazards that may be encountered, in addition to Site location and time and dates of work activities.
- Every attempt to rapidly identify substances to which the worker has been exposed shall be made. This information will be given to medical personnel in the event of an emergency.
- Procedures for decontamination of injured workers and preventing contamination of medical personnel, equipment, and facilities shall be communicated to workers.

### **Medical Emergencies**

Any person who becomes ill or injured in the Exclusion Zone must be decontaminated as soon as possible, giving consideration to which risk will be greater, the spread of contamination or any potential health effects of the individual. If the victim is stable, decontamination is to be completed and First Aid administered as needed prior to transport. If the patient's condition is unstable, only gross decontamination is to be completed (i.e., removal of PPE if necessary), to prevent injury to responder, prior to administering First Aid. First Aid should be administered while awaiting an ambulance or paramedics as appropriate to the injury. Refer to the Decontamination SOP found in Appendix G of this HSP for further details.

Anyone being transported to a clinic or hospital for treatment should have available to them information on any potential chemical(s) to which they could have been exposed to at the Site, along with their medical history.

### **First Aid**

Refer to the SOP for Chemical First Aid found in Appendix I for general chemical first aid procedures. Standard first and CPR procedures should be used in other

medical emergencies. Each first aid kit contains protection equipment that must be worn while performing first aid and CPR. This includes:

- Disposable gloves
- Disposable mouth-to-mouth resuscitator
- Safety goggles/face mask
- Disposable overgarment

Whenever first aid procedures are performed on another person, the Health and Safety Manager must be notified immediately.

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## NAMES AND SIGNATURES

All Montgomery Watson employees working on or visiting this site are to sign below, indicating that they have read this Site Safety Plan (SSP), understand its contents, have been given opportunity to discuss its contents with the Site Safety Officer (SSO) and agree to abide by its requirements.

The supervisors of all subcontractors are to sign below, indicating that they have read this Site Safety Plan (SSP), understand its contents, and have been given opportunity to discuss its contents with the Site Safety Officer (SSO).

<u>Date</u>	<u>Name</u>	<u>Employer</u>	<u>Signature</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
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_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

It is the responsibility of the Site Safety Officer (SSO) to have a completed and signed copy of this SSP returned to the project file.

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**TABLE 1**

**MAXIMUM REPRESENTATIVE CONSTITUENTS**

**GROUNDWATER:**

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Location</u>
Acetone	9,000 ppb	Upper Aquifer
Benzene	100,000 ppb	Upper Aquifer
4-Methylphenol	2,200 ppb	Upper Aquifer
Benzoic Acid	1,900 ppb	Upper Aquifer
Calcium	1,040,000 ppb	Upper Aquifer
Sodium	444,000 ppb	Upper Aquifer
Chloroethane	440 ppb	Lower Aquifer

**SOIL:**

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Location</u>
Acetone Area	34,000,000 ppb	Off-Site Containment
1,1,1-Trichloroethane Area	150,000,000 ppb	Off-Site Containment
Tolvene Area	130,000,000 ppb	Off-Site Containment
Ethylbenzene Area	23,000,000 ppb	Off-Site Containment
Xylene Area	100,000,000 ppb	Off-Site Containment
Benzoic Acid Area	32,000,000 ppb	Off-Site Containment
Naphthalene Area	2,400,000 ppb	Off-Site Containment
Bis (2-Ethylhexyl) Phthalate Area	14,000,000 ppb	Off-Site Containment
Arodor 1254 Area	650,000 ppb	Off-Site Containment
Arodor 1260 Area	560,000 ppb	Off-Site Containment
Calcium Soil	157,000 ppm	Kapica/Pazmey Surface

**SURFACE WATER:**

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Location</u>
Acetone	380 ppb	Drainage Area
Benzene	460 ppb	Drainage Area
4-Methyphenol	590 ppb	Drainage Area
Calcium	334,000 ppb	Drainage Area
Magnesium	61,700 ppb	Drainage Area

**SEDIMENT:**

<u>Compound</u>	<u>Maximum Concentration</u>	<u>Location</u>
-----------------	------------------------------	-----------------

Benzene	14,000 ppb	Drainage Area
Xylene	200 ppb	Drainage Area
Bis (2-Ethylhexyl) Phthalate	13,000 ppb	Drainage Area
Arochlor - 1254	17,000 ppb	Drainage Area
Calcium	73,000 ppb	Drainage Area

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# JOB SAFETY & HEALTH PROTECTION

The Occupational Safety and Health Act of 1970 provides job safety and health protection for workers by promoting safe and healthful working conditions throughout the Nation. Provisions of the Act include the following:

## Employers

All employers must furnish to employees employment and a place of employment free from recognized hazards that are causing or are likely to cause death or serious harm to employees. Employers must comply with occupational safety and health standards issued under the Act.

## Employees

Employees must comply with all occupational safety and health standards, rules, regulations and orders issued under the Act that apply to their own actions and conduct on the job.

The Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor has the primary responsibility for administering the Act. OSHA issues occupational safety and health standards, and its Compliance Safety and Health Officers conduct jobsite inspections to help ensure compliance with the Act.

## Inspection

The Act requires that a representative of the employer and a representative authorized by the employees be given an opportunity to accompany the OSHA inspector for the purpose of aiding the inspection.

Where there is no authorized employee representative, the OSHA Compliance Officer must consult with a reasonable number of employees concerning safety and health conditions in the workplace.

## Complaint

Employees or their representatives have the right to file a complaint with the nearest OSHA office requesting an inspection if they believe unsafe or unhealthful conditions exist in their workplace. OSHA will withhold, on request, names of employees complaining.

The Act provides that employees may not be discharged or discriminated against in any way for filing safety and health complaints or for otherwise exercising their rights under the Act.

Employees who believe they have been discriminated against may file a complaint with their nearest OSHA office within 30 days of the alleged discriminatory action.

## Citation

If upon inspection OSHA believes an employer has violated the Act, a citation alleging such violations will be issued to the employer. Each citation will specify a time period within which the alleged violation must be corrected.

The OSHA citation must be prominently displayed at or near the place of alleged violation for three days, or until it is corrected, whichever is later, to warn employees of dangers that may exist there.

## Proposed Penalty

The Act provides for mandatory penalties against employers of up to \$1,000 for each serious violation and for optional penalties of up to \$1,000 for each nonserious violation. Penalties of up to \$1,000 per day may be proposed for failure to correct violations within the proposed time period. Also, any employer who willfully or repeatedly violates the Act may be assessed penalties of up to \$10,000 for each such violation.

There are also provisions for criminal penalties. Any willful violation resulting in death of an employee, upon conviction, is punishable by a fine of up to \$250,000 (or \$500,000 if the employer is a corporation), or by imprisonment for up to six months, or both. A second conviction of an employer doubles the possible term of imprisonment.

## Voluntary Activity

While providing penalties for violations, the Act also encourages efforts by labor and management, before an OSHA inspection, to reduce workplace hazards voluntarily and to develop and improve safety and health programs in all workplaces and industries. OSHA's Voluntary Protection Programs recognize outstanding efforts of this nature.

OSHA has published Safety and Health Program Management Guidelines to assist employers in establishing or perfecting programs to prevent or control employee exposure to workplace hazards. There are many public and private organizations that can provide information and assistance in this effort, if requested. Also, your local OSHA office can provide considerable help and advice on solving safety and health problems or can refer you to other sources for help such as training.

## Consultation

Free assistance in identifying and correcting hazards and in improving safety and health management is available to employers, without citation or penalty, through OSHA-supported programs in each State. These programs are usually administered by the State Labor or Health department or a State university.

## Posting Instructions

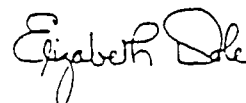
Employers in States operating OSHA approved State Plans should obtain and post the State's equivalent poster.

*Under provisions of Title 29, Code of Federal Regulations, Part 1903.2(a)(1) employers must post this notice (or facsimile) in a conspicuous place where notices to employees are customarily posted.*

## More Information

Additional information and copies of the Act, specific OSHA safety and health standards, and other applicable regulations may be obtained from your employer or from the nearest OSHA Regional Office in the following locations:

Atlanta	(404) 347-3573
Boston	(617) 565-7164
Chicago	(312) 353-2220
Dallas	(214) 767-4731
Denver	(303) 844-3061
Kansas	(816) 426-5861
New York	(212) 337-3225
Philadelphia	(215) 596-1201
San Francisco	(415) 995-5672



Elizabeth Dole, Secretary of Labor

U.S. Department of Labor  
Occupational Safety and Health Administration

Washington, D.C.  
1989 (Revised)  
OSHA 2203





A



A

## SAFETY CHECKLISTS

# SITE HEALTH AND SAFETY CHECKLIST - COMPREHENSIVE

## GENERAL INFORMATION

Date: \_\_\_\_\_ Checklist completed by: \_\_\_\_\_  
Project number: \_\_\_\_\_ Project name: \_\_\_\_\_  
Location: \_\_\_\_\_  
Site Manager: \_\_\_\_\_ Site Safety Officer: \_\_\_\_\_  
Weather: ☐ windy ☐ fair ☐ cloudy ☐ dry ☐ rain ☐ sleet  
☐ snow temperature \_\_\_\_\_ °C/°F

## SAFETY INFORMATION

☐ Yes ☐ No ☐ N/A Signed SSP on-site:  
☐ available ☐ posted  
☐ Yes ☐ No ☐ N/A SSP reviewed and signed by necessary personnel.

☐ Yes ☐ No ☐ N/A MSDSs on site for all hazardous materials brought to  
site by personnel.  
☐ available ☐ posted

☐ Yes ☐ No ☐ N/A Designated SSO present.

☐ Yes ☐ No ☐ N/A Site safety briefing held.  
Date of last briefing: \_\_\_\_/\_\_\_\_/\_\_\_\_

☐ Yes ☐ No ☐ N/A On-site MW personnel meet OSHA requirements for:  
☐ Yes ☐ No ☐ N/A • H&S training  
☐ Yes ☐ No ☐ N/A • Medical surveillance  
☐ Yes ☐ No ☐ N/A • Respirator fit test  
On-site MW subcontractors meet OSHA requirements  
for:  
☐ Yes ☐ No ☐ N/A • H&S training  
☐ Yes ☐ No ☐ N/A • Medical surveillance  
☐ Yes ☐ No ☐ N/A • Respirator fit test  
☐ Yes ☐ No ☐ N/A Work being done in compliance with SSP and SOPs.

☐ Yes ☐ No ☐ N/A Equipment specified in SSP available.  
☐ Yes ☐ No ☐ N/A Equipment specified in SSP in working order.  
☐ Yes ☐ No ☐ N/A Equipment manuals available.  
☐ Yes ☐ No ☐ N/A Monitoring equipment calibrated.  
☐ Yes ☐ No ☐ N/A Calibration records available.

- ☐ Yes ☐ No ☐ N/A Responsible personnel know how to operate monitoring equipment.
- ☐ Yes ☐ No ☐ N/A Adequate equipment/materials inventory available.
- ☐ Yes ☐ No ☐ N/A Radiation monitoring badges being worn by all personnel working with nuclear density gauges.
- ☐ Yes ☐ No ☐ N/A Zones established and enforced:
- ☐ Yes ☐ No ☐ N/A • Exclusion
  - ☐ Yes ☐ No ☐ N/A • Decontamination
  - ☐ Yes ☐ No ☐ N/A • Support/clean
- ☐ Yes ☐ No ☐ N/A Proper decontamination procedures:
- ☐ Yes ☐ No ☐ N/A • Set up
  - ☐ Yes ☐ No ☐ N/A • Enforced
- ☐ Yes ☐ No ☐ N/A Emergency telephone numbers posted.
- ☐ Yes ☐ No ☐ N/A Emergency route to hospital posted.
- ☐ Yes ☐ No ☐ N/A Local officials notified.
- ☐ Yes ☐ No ☐ N/A At least one person on-site has current first aid and CPR certification.
- ☐ Yes ☐ No ☐ N/A Appropriate first aid materials on site:
- ☐ Yes ☐ No ☐ N/A • 15 minute eye wash
  - ☐ Yes ☐ No ☐ N/A • First aid kit
  - ☐ Yes ☐ No ☐ N/A Special emergency procedures implemented.

#### **SAFETY EQUIPMENT UTILIZED BY FIELD CREW**

- ☐ Yes ☐ No ☐ N/A Field/Health and Safety Equipment Checklists complete and current.

#### **COMMENTS**

Effectiveness of SSP:

Deficiencies noted:

Remedial actions required/taken:

## HEALTH AND SAFETY MEETING ATTENDANCE

[illegible]

## SITE HEALTH AND SAFETY CHECKLIST - DAILY

Date: \_\_\_\_\_ Checklist completed by: \_\_\_\_\_  
Project number: \_\_\_\_\_ Project name: \_\_\_\_\_  
Location: \_\_\_\_\_  
Site Manager: \_\_\_\_\_ Site Safety Officer: \_\_\_\_\_  
Weather: ☐ windy ☐ fair ☐ cloudy ☐ dry ☐ rain ☐ sleet  
☐ snow temperature: \_\_\_\_\_ °C / °F

### Topic covered?

☐ Yes ☐ No ☐ N/A

☐ Yes ☐ No ☐ N/A

☐ Yes ☐ No ☐ N/A

☐ Yes ☐ No ☐ N/A

☐ Yes ☐ No ☐ N/A

☐ Yes ☐ No ☐ N/A

☐ Yes ☐ No ☐ N/A

☐ Yes ☐ No ☐ N/A

☐ Yes ☐ No ☐ N/A

☐ Yes ☐ No ☐ N/A

☐ Yes ☐ No ☐ N/A

☐ Yes ☐ No ☐ N/A

☐ Yes ☐ No ☐ N/A

☐ Yes ☐ No ☐ N/A

☐ Yes ☐ No ☐ N/A

☐ Yes ☐ No ☐ N/A

☐ Yes ☐ No ☐ N/A

☐ Yes ☐ No ☐ N/A

☐ Yes ☐ No ☐ N/A

☐ Yes ☐ No ☐ N/A

☐ Yes ☐ No ☐ N/A

☐ Yes ☐ No ☐ N/A

### Site hazards

- General site health and safety hazards
- Specific hazards associated with substances of concern
- Routes of exposure
- Specific hazards associated with a task/job
- Physical stresses/hazards
- "Buddy" system

### Site Safety Plan

- Role/duties of Site Safety Officer (SSO)
- Ambient air monitoring
- Emergency procedures/hospital routes

### Personal Protection

- Required PPE
- SCBA/Air-supplying respirator review
- Proper donning/doffing techniques

### Decontamination

- Overview of station(s)
- Proper techniques
- Field equipment decontamination
- Heavy equipment/machinery decontamination
- Vehicle movement
- Personal hygiene

## Health and Safety Meeting Attendance

**Date**

**Name**

**Employer**

**Signature**

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

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## EXCAVATION SAFETY CHECKLIST

(This form is to be completed daily.)

Project: \_\_\_\_\_ Project #: \_\_\_\_\_

Competent Person: \_\_\_\_\_ Date: \_\_\_\_\_

### Utilities Checked

\_\_\_\_ Telephone  
\_\_\_\_ Electric  
\_\_\_\_ Natural Gas  
\_\_\_\_ Water

\_\_\_\_ Sewer  
\_\_\_\_ Cable TV  
\_\_\_\_ Other

### Secure Surface & Overhead Structures

\_\_\_\_ Power Poles  
\_\_\_\_ Overhead Obstacles  
\_\_\_\_ Roads

\_\_\_\_ Buildings/Foundations  
\_\_\_\_ Sidewalks  
\_\_\_\_ Other

### Trench Depth

\_\_\_\_ 0-5'    \_\_\_\_ 5'-10'    \_\_\_\_ 10'-15'    \_\_\_\_ 15'-20'    \_\_\_\_ >20'

### Egress

Ladder Present in Trench                      Yes                      No

(Ladder required at trench depths of 4' or greater)

(Ladder to extend 36" above ground surface)

(Ladder or ramp within 25' of linear travel in either direction)

### Soil Classification

Visual Analysis of Soil

\_\_\_\_ Cracks/Fissures/Spalling of Trench Sides  
\_\_\_\_ Water Seeping From Sides or Bottom  
\_\_\_\_ Different Soil in Layers  
\_\_\_\_ Soil Previously Disturbed  
\_\_\_\_ Underground Utilities Present  
\_\_\_\_ Continuous Vibration Present

Penetrometer Reading: \_\_\_\_\_



	<u><b>A</b></u>	<u><b>B</b></u>	<u><b>C</b></u>
Penetrometer Reading	≥ 1.5 tsf	1.5-0.5 tsf	<0.5 tsf
	Not Previously Disturbed	Previously Disturbed	Previously Disturbed
	Stable Dry Rock	Cracks Fissures	Seeping Soil Wet Soil
Maximum Slope	53 deg. (3/4:1)	45 deg. (1:1)	34 deg. (1-1/2:1)

### **Vehicular Traffic**

Area Properly Barricaded ☐ Yes ☐ No

Reflective Clothing Worn ☐ Yes ☐ No

Flagman Present as Necessary ☐ Yes ☐ No

Protective System in Place to Prevent Vehicles Unloading Fill Materials From Backing into Excavation ☐ Yes ☐ No

### **Other Hazards**

Check for Hazardous Atmospheres

☐ Oxygen ☐ Combustibles ☐ Organic Vapors ☐ Other

Confined Space Permit Acquired ☐ Yes ☐ No

Excavated materials and equipment at least 2 feet from edge of excavation and no other overhead hazards to personnel in excavation ☐ Yes ☐ No

Water removed from excavation ☐ Yes ☐ No

Ramps, Walkways, Bridges over Excavations Equipped with Handrails ☐ Yes ☐ No

Shoring System Designed by Professional Engineer ☐ Yes ☐ No

Excavations Barricaded or Filled in at End of Day ☐ Yes ☐ No

B



B

CHEMICAL HAZARD  
SUMMARY INFORMATION

## ACETONE

CAS #:	67-64-1	ACGIH TLV:	750 ppm
MOL. WT:	58.08	ACGIH STEL:	1000 ppm
CONC IDLH:	20000 ppm	OSHA PEL:	1000 ppm
NIOSH REL:	250 ppm		

### DESCRIPTION

Physical:	Colorless liquid with fragrant, mint-like odor
Odor:	residual; ketonic, pleasant, non-residual
Odor Threshold:	100 ppm

### CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	133 F	56.1 C	Vapor Pressure:	196 mm @ 21 C
Melting Point:	-137.7 F	-94.3 C	Ionization Potential:	6.87 to 7.19
Flash Point:	1.3 F	-17.05 C	Upper Explosion Limit:	12.80%
Solubility:	miscible		Lower Explosion Limit:	2.60%

**INCOMPATIBILITIES:** Ox, Acids

### ROUTES OF EXPOSURE

Target Organs:	Respiratory system, skin, eyes, CNS
Health Hazards:	May be poisonous if inhaled or absorbed through skin. Vapors may cause dizziness or suffocation. Fire may produce irritating or poisonous gases. Runoff from fire control or dilution water may cause pollution.

### SYMPTOMS OF OVEREXPOSURE

Inhalation:	Vapor irritating to eyes and mucous membranes; acts as an anesthetic in very high concentrations
Ingestion:	Low order of toxicity but very irritating to mucous membranes
Skin:	Prolonged excessive contact causes defatting of the skin, possibly leading to dermatitis

### FIRST AID

Move victim to fresh air and call emergency medical care. If breathing is difficult, administer artificial respiration or oxygen. For skin contact, wash well with water. For eyes, flush with water immediately for at least 15 minutes, and call a physician. Seek immediate medical attention if ingested; induce vomiting if victim is conscious and has swallowed large amounts.

### NFPA RATINGS

Health Hazard (Blue):	(1)slightly hazardous to health; wear self-contained breathing apparatus as a precaution
Flammability (Red):	(3)can be ignited under almost all temperature conditions
Reactivity (Yellow):	(0)stable even under fire conditions
Special:	no data

## BENZENE

CAS #:	71-43-2	ACGIH TLV:	10 ppm
MOL. WT:	78.11	ACGIH STEL:	susp. human carcinogen
CONC IDLH:	3000 ppm	OSHA PEL:	TWA 1 ppm;
NIOSH REL:	.1 ppm		STEL 5 ppm

### DESCRIPTION

Physical:	Colorless to pale yellow watery liquid with a gasoline-like odor
Odor:	gasoline-like
Odor Threshold:	4.68 ppm

### CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	176 F	80 C	Vapor Pressure:	75 mm @ 20 C
Melting Point:	42 F	5.5 C	Ionization Potential:	9.25
Flash Point:	11.9 F	-11.15 C	Upper Explosion Limit:	7.1%
Solubility:	0.06%		Lower Explosion Limit:	1.3%

**INCOMPATIBILITIES:** Strong ox, chlorine, bromine with iron

### ROUTES OF EXPOSURE

Target Organs:	Blood, CNS, skin, bone marrow, eyes, resp sys
Health Hazards:	May be poisonous if inhaled or absorbed through skin. Vapors may cause dizziness or suffocation. Contact may irritate or burn skin and eyes. Fire may produce irritating or poisonous gases. Runoff from fire control or dilution water may cause pollution.

### SYMPTOMS OF OVEREXPOSURE

Dizziness, excitation, pallor followed by flushing, weakness, headache, breathlessness, chest constriction.

### FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

### NFPA RATINGS

Health Hazard (Blue):	(2)hazardous to health; area may be entered with self-contained breathing apparatus
Flammability (Red):	(3)material can be ignited under almost all temperature conditions
Reactivity (Yellow):	(0)stable even under fire conditions
Special:	no data

# BENZOIC ACID

BZA

Common Synonyms Benzenecarbonic acid Carboxybenzene Dracypic acid		Solid crystals or powder	White	Faint pleasant odor
Avoid contact with solid and dust. Keep people away. Wear goggles and self-contained breathing apparatus. Stay upwind and use water spray to "knock down" dust. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire		Combustible Vapor may explode if ignited in an enclosed area. Dust may form explosive mixture with air. Extinguish with water, dry chemical, chemical foam, or carbon dioxide.		
Exposure		CALL FOR MEDICAL AID DUST Irritating to nose and throat if inhaled. Move to fresh air. SOLID Irritating to skin and eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Disperse and flush.		2. LABEL 2.1 Category: None 2.2 Class: Not pertinent		
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Not applicable 3.2 Formula: C <sub>6</sub> H <sub>5</sub> COOH 3.3 IMO/UN Designation: Not listed 3.4 DOT ID No.: 9094 3.5 CAS Registry No.: 65-85-0		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Faint, pleasant, slight aromatic		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Bureau of Mines dust respirator when melted material present; use eye protection and organic respirator for fumes. 5.2 Symptoms Following Exposure: Dust may be irritating to nose and eyes. At elevated temperatures, fumes may cause irritation of eyes, respiratory system, and skin. 5.3 Treatment of Exposure: Remove patient to fresh air. EYE CONTACT: flush eyes with water. 5.4 Threshold Limit Value: Not pertinent. 5.5 Short Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Grade 2; LD <sub>50</sub> = 0.5 to 5 g/kg 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause stinging and reddening of the skin. Dust may irritate nose and eyes. 5.10 Odor Threshold: Not pertinent. 5.11 IDLH Value: Data not available.				

<b>6. FIRE HAZARDS</b> 6.1 Flash Point: 250°F C.C. 6.2 Flammable Limits in Air: Not pertinent. 6.3 Fire Extinguishing Agents: Dry powder, chemical foam, water fog, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: None. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Vapor from molten benzoic acid may form explosive mixture with air. Concentrated dust may form explosive mixture. 6.7 Ignition Temperature: 1063°F. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent. 6.10 Adiabatic Flame Temperature: Data not available.	<b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) II								
<b>7. CHEMICAL REACTIVITY</b> 7.1 Reactivity With Water: Not pertinent. 7.2 Reactivity With Common Materials: Not pertinent. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent. 7.7 Molar Ratio (Reactant to Product): Data not available. 7.8 Reactivity Group: Data not available.	<b>11. HAZARD CLASSIFICATIONS</b> 11.1 Code of Federal Regulations: ORM-E 11.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 11.3 NFPA Hazard Classification: <table> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>1</td></tr> <tr> <td>Reactivity (Yellow)</td><td></td></tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	1	Reactivity (Yellow)	
Category	Classification								
Health Hazard (Blue)	2								
Flammability (Red)	1								
Reactivity (Yellow)									
<b>8. WATER POLLUTION</b> 8.1 Aquatic Toxicity: 200 ppm/7 hr/goldfish/lethal/fresh water 500 ppm/1 hr/sunfish/lethal/fresh water 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 165%, 5 days. 8.4 Food Chain Concentration Potential: None.	<b>12. PHYSICAL AND CHEMICAL PROPERTIES</b> 12.1 Physical State at 15°C and 1 atm: Solid. 12.2 Molecular Weight: 122.12. 12.3 Boiling Point at 1 atm: 480.6°F = 249.2°C = 522.4°K. 12.4 Freezing Point: 252.1°F = 122.3°C = 395.5°K. 12.5 Critical Temperature: 894°F = 479°C = 752°K. 12.6 Critical Pressure: 660 psia = 45 atm = 4.6 MN/m <sup>2</sup> . 12.7 Specific Gravity: 1.316 at 28°C (solid). 12.8 Liquid Surface Tension: Not pertinent. 12.9 Liquid Water Interfacial Tension: Not pertinent. 12.10 Vapor (Gas) Specific Gravity: Not pertinent. 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 12.12 Latent Heat of Vaporization: Not pertinent. 12.13 Heat of Combustion: Not pertinent. 12.14 Heat of Decomposition: Not pertinent. 12.15 Heat of Solution: Not pertinent. 12.16 Heat of Polymerization: Not pertinent. 12.25 Heat of Fusion: 33.89 cal/g. 12.26 Limiting Value: Data not available. 12.27 Reid Vapor Pressure: Data not available.								
<b>9. SHIPPING INFORMATION</b> 9.1 Grades of Purity: USP, FCC grade 99.5%-100.5%. 9.2 Storage Temperature: Data not available. 9.3 Inert Atmosphere: Data not available. 9.4 Venting: Data not available.	<b>6. FIRE HAZARDS (Continued)</b> 6.11 Stoichiometric Air to Fuel Ratio: Data not available. 6.12 Flame Temperature: Data not available.								

BZA	BENZOIC ACID
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12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit-inch per hour- square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77.02	.340		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CALCIUM

CAM

Common Synonyms	Solid	Silvery to grayish white	Odorless
		Sinks in water. Reacts slowly with water	
Avoid contact with solid and dust. Keep people away. Wear rubber overclothing (including gloves) Call fire department Isolate and remove discharged material Notify local health and pollution control agencies			
Fire	FLAMMABLE Extinguish with dry graphite, soda ash, or other inert powder. DO NOT USE WATER, FOAM, CARBON DIOXIDE OR VAPORIZING LIQUIDS ON FIRE		
Exposure	CALL FOR MEDICAL AID  SOLID Will burn skin and eyes Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES, hold eyelids open and flush with plenty of water		
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes  Notify local health and wildlife officials Notify operators of nearby water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Disperse and flush		2. LABEL 2.1 Category: Flammable solid 2.2 Class: 4	
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Not applicable 3.2 Formula: Ca 3.3 IMO/UN Designation: 4.3/1401 3.4 DOT ID No.: 1401 3.5 CAS Registry No.: Data not available		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Silvery; turns to grayish-white on exposure to air 4.3 Odor: None	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles and rubber gloves 5.2 Symptoms Following Exposure: Contact with eyes or skin produces caustic burns 5.3 Treatment of Exposure: Flush with water 5.4 Threshold Limit Value: Not pertinent 5.5 Short Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent 5.11 IDLH Value: Not pertinent			

<p><b>6. FIRE HAZARDS</b> 6.1 Flash Point: Not pertinent (flammable solid) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Dry graphite, soda ash, powdered sodium chloride, or appropriate metal fire extinguishing dry powder 6.4 Fire Extinguishing Agents Not to be Used: Water, halogenated hydrocarbons, dry chemical, carbon dioxide, foam 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Burns violently, especially if finely divided. 6.7 Ignition Temperature: 1454 ± 18°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent 6.10 Adiabatic Flame Temperature: Data not available</p> <p>(Continued)</p>	<p><b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) II-RR</p> <p><b>11. HAZARD CLASSIFICATIONS</b> 11.1 Code of Federal Regulations: Flammable solid 11.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification:  <table> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>1</td></tr> <tr> <td>Flammability (Red)</td><td>1</td></tr> <tr> <td>Reactivity (Yellow)</td><td>2</td></tr> </tbody> </table> </p>	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	1	Reactivity (Yellow)	2
Category	Classification								
Health Hazard (Blue)	1								
Flammability (Red)	1								
Reactivity (Yellow)	2								
<p><b>7. CHEMICAL REACTIVITY</b> 7.1 Reactivity With Water: Reacts to form flammable hydrogen gas, which may ignite. The reaction is not violent. 7.2 Reactivity with Common Materials: Reacts with moist air to form skin of hydroxide. The reaction is not hazardous. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water 7.5 Polymerization: Stable 7.6 Inhibitor of Polymerization: Stable 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: Data not available</p>	<p><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b> 12.1 Physical State at 15°C and 1 atm: Solid 12.2 Molecular Weight: 40.1 12.3 Boiling Point at 1 atm: 2,714°F = 1,490°C = 1,763°K 12.4 Freezing Point: 1,562°F = 850°C = 1,123°K 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 1.55 at 20°C (solid) 12.8 Liquid Surface Tension: Not pertinent 12.9 Liquid Water Interfacial Tension: Not pertinent 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: -6790 Btu/lb = -3,770 cal/g = -158 X 10<sup>3</sup> J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 55.7 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available</p>								
<p><b>8. WATER POLLUTION</b> 8.1 Aquatic Toxicity: See Calcium hydroxide (CAH) 8.2 Waterflow Toxicity: See Calcium hydroxide (CAH) 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None</p>	<p><b>9. SHIPPING INFORMATION</b> 9.1 Grades of Purity: Commercial, 99.5%; redistilled 99.9% 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Sealed containers must be in a ventilated area</p>								
<p><b>6. FIRE HAZARDS (Continued)</b> 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>									



CAM

## CALCIUM

12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit-inch per hour- square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

## CHLOROETHANE

CAS #:	75-00-3	ACGIH TLV:	1,000 ppm
MOL. WT:	64.52	ACGIH STEL:	1,250 ppm
CONC IDLH:	20,000 ppm	OSHA PEL:	1000 ppm
NIOSH REL:	pot. occup. carcinogen		

### DESCRIPTION

Physical: Colorless liquid or gas with a pungent, ether-like odor  
Odor: ether-like  
Odor Threshold: no data

### CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	54 F	12.2 C	Vapor Pressure:	1064 mm
Melting Point:	-218 F	-138.9 C	Ionization Potential:	10.97
Flash Point:	-58.3 F	-50.15 C	Upper Explosion Limit:	15.4%
Solubility:	soluble in 0.574 g/100ml		Lower Explosion Limit:	3.8%

**INCOMPATIBILITIES:** Chemically active metals: sodium, potassium, calcium, powdered aluminum, zinc, magnesium

### ROUTES OF EXPOSURE

Target Organs: Skin, eyes, mucous membrane, liver, kidneys, resp sys, cardiovascular system  
Health Hazards: May be poisonous if inhaled or absorbed through skin.  
Vapors may cause dizziness or suffocation.  
Contact may irritate or burn skin and eyes.  
Fire may produce irritating or poisonous gases.  
Runoff from fire control or dilution water may cause pollution.

### SYMPTOMS OF OVEREXPOSURE

Vapor causes drunkenness, anesthesia, possible lung injury. Liquid may cause frostbite on eyes and skin.

### FIRST AID

Move victim to fresh air, keep warm and quiet and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. For eyes, immediately flush with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate clothing and shoes at the site. Treat frostbite.

### NEPA RATINGS

Health Hazard (Blue): (2)hazardous to health; wear self-contained breathing apparatus to enter area  
Flammability (Red): (4)material forms readily ignitable mixtures in air  
Reactivity (Yellow): (0)stable even under fire conditions  
Special: no data

# CRESOLS

CRS

<b>Common Synonyms</b> Cresylic acids Hydroxytoluenes Methylphenols Oxytoluenes Tar acids		Watery liquid, or solid crystals Colorless or yellow Sweet tarry odor
Avoid contact with liquid. Keep people away. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.		
<b>Fire</b>	Combustible <b>POISONOUS GASES MAY BE PRODUCED IN FIRE</b> Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemical, foam or carbon dioxide. Cool exposed containers with water.	
<b>Exposure</b>	<b>CALL FOR MEDICAL AID</b> <b>LIQUID</b> Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. <b>DO NOT INDUCE VOMITING</b>	
<b>Water Pollution</b>	<b>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.</b> May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	
<b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Issue warning-water contaminant, poison. Restrict access. Should be removed. Chemical and physical treatment.		<b>2. LABEL</b> 2.1 Category: Corrosive 2.2 Class: 8
<b>3. CHEMICAL DESIGNATIONS</b> 3.1 CG Compatibility Class: Phenols, Cresols 3.2 Formula: $C_6H_5C_6H_4OH$ 3.3 IMO/UN Designation: 9.0/2076 3.4 DOT ID No.: 2076 3.5 CAS Registry No.: 1319-77-3		<b>4. OBSERVABLE CHARACTERISTICS</b> 4.1 Physical State (as shipped): Liquid or solid 4.2 Color: Colorless to dark yellow 4.3 Odor: Sweet, tarry
<b>5. HEALTH HAZARDS</b> 5.1 Personal Protective Equipment: Organic vapor canister unit (USBM Type B) approved by U.S. Bureau of Mines. Rubber gloves, chemical safety goggles, face shield, coveralls and/or rubber apron; rubber shoes or boots. 5.2 Symptoms Following Exposure: Vapors cause irritation of eyes, nose, and throat. Contact with skin or eyes causes severe burns. Chemical is rapidly absorbed through skin. 5.3 Treatment of Exposure: Call a physician. INHALATION: remove to fresh air. INGESTION: have victim drink water or milk; do NOT induce vomiting. SKIN OR EYES: flush immediately with plenty of water for at least 15 min.; remove contaminated clothing immediately and wash before reuse; discard contaminated shoes. 5.4 Threshold Limit Value: 5 ppm. 5.5 Short Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2; $LD_{50} = 0.5$ to $5$ g/kg (rat, rabbit). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Fairly severe skin irritant; may cause pain and second-degree burns after a few minutes' contact. 5.10 Odor Threshold: 5 ppm. 5.11 IDLH Value: 250 ppm.		

<div>6. FIRE HAZARDS</div> <div><div>6.1 Flash Point: 175-185°F O.C.; 178°F C.C.</div><div>6.2 Flammable Limits in Air: LEL: 1.4% (ortho); 1.1% (meta or para).</div><div>6.3 Fire Extinguishing Agents: Water, dry chemical, carbon dioxide, and foam.</div><div>6.4 Fire Extinguishing Agents Not to be Used: Not pertinent.</div><div>6.5 Special Hazards of Combustion Products: Flammable toxic vapors given off in a fire.</div><div>6.6 Behavior in Fire: Sealed closed containers can build up pressure if exposed to heat.</div><div>6.7 Ignition Temperature: 1110°F (o-cresol); 1038°F (m- or p-cresol).</div><div>6.8 Electrical Hazard: Data not available.</div><div>6.9 Burning Rate: Data not available.</div><div>6.10 Adiabatic Flame Temperature: Data not available</div></div> <div>(Continued)</div> <div>7. CHEMICAL REACTIVITY</div> <div><div>7.1 Reactivity With Water: No reaction.</div><div>7.2 Reactivity with Common Materials: No reaction.</div><div>7.3 Stability During Transport: Stable.</div><div>7.4 Neutralizing Agents for Acids and Caustics: Not pertinent.</div><div>7.5 Polymerization: Not pertinent.</div><div>7.6 Inhibitor of Polymerization: Not pertinent.</div><div>7.7 Molar Ratio (Reactant to Product): Data not available.</div><div>7.8 Reactivity Group: 21.</div></div> <div>8. WATER POLLUTION</div> <div><div>8.1 Aquatic Toxicity: 24 mg/l/96 hr/bluegill/<math>TL_{50}</math>/fresh water 10-100 ppm/48 hr/shrimp/<math>LC_{50}</math>/salt water.</div><div>8.2 Waterfowl Toxicity: Data not available.</div><div>8.3 Biological Oxygen Demand (BOD): m-cresol: 170%, 5 days o-cresol: 164%, 5 days p-cresol: 144%, 5 days.</div><div>8.4 Food Chain Concentration Potential: None.</div></div> <div>9. SHIPPING INFORMATION</div> <div><div>9.1 Grades of Purity: USP Liquid (mixed isomers) Phenol-cresol mixtures Ortho-cresol 80 to 98% containing phenol Meta-cresol 60 to 98% containing other cresols and xylenols Para-cresol 92 to 98% containing meta-cresol Meta-para-cresol containing ortho-cresol and xylenols "Resin" cresols containing phenols and xylenols Cresylic acids containing xylenols, cresols and phenols.</div><div>9.2 Storage Temperature: Ambient.</div><div>9.3 Inert Atmosphere: No requirement.</div><div>9.4 Venting: Open.</div></div>	<div>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-P-Q-T-U-X-Y</div> <div>11. HAZARD CLASSIFICATIONS</div> <div><div>11.1 Code of Federal Regulations: Corrosive material.</div><div>11.2 NAS Hazard Rating for Bulk Water Transportation: <table><thead><tr><th>Category</th><th>Rating</th></tr></thead><tbody><tr><td>Fire</td><td>1</td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td>2</td></tr><tr><td>Liquid or Solid Irritant</td><td>3</td></tr><tr><td>Poisons</td><td>2</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td>1</td></tr><tr><td>Aquatic Toxicity</td><td>3</td></tr><tr><td>Aesthetic Effect</td><td>4</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td>2</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>0</td></tr></tbody></table></div><div>11.3 NFPA Hazard Classification: <table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td></td><td>meta and ortho para</td></tr><tr><td>Health Hazard (Blue)</td><td>3 3</td></tr><tr><td>Flammability (Red)</td><td>2 1</td></tr><tr><td>Reactivity (Yellow)</td><td>0 0</td></tr></tbody></table></div></div> <div>12. PHYSICAL AND CHEMICAL PROPERTIES</div> <div><div>12.1 Physical State at 15°C and 1 atm: Liquid.</div><div>12.2 Molecular Weight: 108.13.</div><div>12.3 Boiling Point at 1 atm: &gt;350°F = &gt;177°C = &gt;450°K.</div><div>12.4 Freezing Point: Not pertinent.</div><div>12.5 Critical Temperature: Not pertinent.</div><div>12.6 Critical Pressure: Not pertinent.</div><div>12.7 Specific Gravity: 1.03-1.07 at 20°C (liquid).</div><div>12.8 Liquid Surface Tension: 37 dynes/cm = 0.037 N/m at 20°C.</div><div>12.9 Liquid Water Interfacial Tension: Data not available.</div><div>12.10 Vapor (Gas) Specific Gravity: Not pertinent.</div><div>12.11 Ratio of Specific Heats of Vapor (Gas): 1.073.</div><div>12.12 Latent Heat of Vaporization: (est.) 200 Btu/lb = 110 cal/g = <math>4.6 \times 10^4</math> J/kg.</div><div>12.13 Heat of Combustion: -14,720 to -14,740 Btu/lb = -8180 to -8190 cal/g = -342.5 to -342.9 <math>\times 10^3</math> J/kg.</div><div>12.14 Heat of Decomposition: Not pertinent.</div><div>12.15 Heat of Solution: Not pertinent.</div><div>12.16 Heat of Polymerization: Not pertinent.</div><div>12.25 Heat of Fusion: 26.28 cal/g (p-Cresol).</div><div>12.26 Limiting Value: Data not available.</div><div>12.27 Reid Vapor Pressure: 0.03 psia.</div></div>	Category	Rating	Fire	1	Health		Vapor Irritant	2	Liquid or Solid Irritant	3	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	3	Aesthetic Effect	4	Reactivity		Other Chemicals	2	Water	0	Self Reaction	0	Category	Classification		meta and ortho para	Health Hazard (Blue)	3 3	Flammability (Red)	2 1	Reactivity (Yellow)	0 0
Category	Rating																																						
Fire	1																																						
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	meta and ortho para																																						
Health Hazard (Blue)	3 3																																						
Flammability (Red)	2 1																																						
Reactivity (Yellow)	0 0																																						
<div>6. FIRE HAZARDS (Continued)</div> <div><div>6.11 Stoichiometric Air to Fuel Ratio: Data not available.</div><div>6.12 Flame Temperature: Data not available.</div></div>																																							

12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F (estimate)	Temperature (degrees F)	British thermal unit-inch per hour- square foot-F	Temperature (degrees F)	Centipoise (estimate)
35	65.469	46	.490	52	1.048	40	15.050
40	65.349	48	.490	54	1.048	50	12.020
45	65.230	50	.490	56	1.048	60	9.678
50	65.110	52	.490	58	1.048	70	7.858
55	64.990	54	.490	60	1.048	80	6.430
60	64.860	56	.490	62	1.048	90	5.300
65	64.740	58	.490	64	1.048	100	4.399
70	64.620	60	.490	66	1.048	110	3.675
75	64.500	62	.490	68	1.048	120	3.089
80	64.379	64	.490	70	1.048	130	2.612
85	64.259	66	.490	72	1.048	140	2.221
90	64.139	68	.490	74	1.048	150	1.899
95	64.009	70	.490	76	1.048	160	1.632
100	63.890	72	.490	78	1.048	170	1.409
		74	.490	80	1.048	180	1.222
		76	.490	82	1.048	190	1.064
		78	.490	84	1.048	200	.931
		80	.490	86	1.048	210	.818
		82	.490	88	1.048		
		84	.490	90	1.048		
		86	.490	92	1.048		
		88	.490	94	1.048		
		90	.490	96	1.048		
		92	.490	98	1.048		
		94	.490	100	1.048		
		96	.490	102	1.048		

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch (estimate)	Temperature (degrees F)	Pounds per cubic foot (estimate)	Temperature (degrees F)	British thermal unit per pound-F
68.02	2.200	40	.004	40	.00008	0	.236
		60	.008	60	.00016	20	.246
		80	.017	80	.00032	40	.257
		100	.034	100	.00060	60	.267
		120	.062	120	.00109	80	.276
		140	.111	140	.00187	100	.286
		160	.192	160	.00312	120	.296
		180	.319	180	.00502	140	.305
		200	.514	200	.00785	160	.314
		220	.805	220	.01193	180	.323
		240	1.230	240	.01771	200	.332
		260	1.835	260	.02568	220	.341
		280	2.679	280	.03648	240	.350
		300	3.834	300	.05084	260	.358
		320	5.387	320	.06960	280	.366
		340	7.442	340	.09374	300	.375
						320	.382
						340	.390
						360	.398
						380	.405
						400	.413
						420	.420
						440	.427

## DIOCTYL PHTHALATE

DOP

Common Synonyms Phthalic acid; bis (2-ethoxyethyl ester) DOP Bis (2-ethoxyethyl) phthalate Di (2-ethoxyethyl) phthalate Octol		Only liquid	Colorless	Slight odor
Stop discharge if possible Call fire department Isolate discharge if possible Notify local health and pollution control agencies				
Fire		Combustible Extinguish with dry chemical, foam, or carbon dioxide		
Exposure		Not harmful		
Water Pollution		Effect of low concentrations on aquatic life is unknown. Fouling to shoreline May be dangerous if it enters water intakes  Notify local health and wildlife officials Notify operators of nearby water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Mechanical containment Chemical and physical treatment		2. LABEL 2.1 Category: None 2.2 Class: Not pertinent		
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Ester 3.2 Formula: $\text{O}-\text{C}_8\text{H}_7[\text{COOCH}_2\text{CH}(\text{C}_8\text{H}_7)(\text{CH}_2)_7\text{CH}_3]_2$ 3.3 IMO/UN Designation: Not listed 3.4 DOT ID No.: Data not available 3.5 CAS Registry No.: 117-84-0		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Colorless 4.3 Odor: Very slight		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Not required 5.2 Symptoms Following Exposure: Produces no ill effects at normal temperatures but may give off irritating vapor at high temperature 5.3 Treatment of Exposure: Leave contaminated area; wash skin with soap and water; flush eyes with water 5.4 Threshold Limit Value: Not pertinent 5.5 Short Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 0, LD <sub>50</sub> above 15 g/kg (rat) 5.7 Late Toxicity: Not established 5.8 Vapor (Gas) Irritant Characteristics: Nonirritating to the eyes and throat 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin 5.10 Odor Threshold: Not pertinent 5.11 IDLH Value: Data not available				

<div>6. FIRE HAZARDS</div> <div>6.1 Flash Point: 425°F OC</div> <div>6.2 Flammable Limits in Air: Not pertinent</div> <div>6.3 Fire Extinguishing Agents: Dry powder, carbon dioxide, foam</div> <div>6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing</div> <div>6.5 Special Hazards of Combustion Products: None</div> <div>6.6 Behavior in Fire: Not pertinent</div> <div>6.7 Ignition Temperature: Data not available</div> <div>6.8 Electrical Hazard: Not pertinent</div> <div>6.9 Burning Rate: Data not available</div> <div>6.10 Adiabatic Flame Temperature: Data not available</div> <div>6.11 Stoichiometric Air to Fuel Ratio: Data not available</div> <div>6.12 Flame Temperature: Data not available</div>	<div>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U-X-Y</div> <div>11. HAZARD CLASSIFICATIONS</div> <div>11.1 Code of Federal Regulations: Not listed</div> <div>11.2 NAS Hazard Rating for Bulk Water Transportation: Not listed</div> <div>11.3 NFPA Hazard Classification:<table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazard (Blue)</td><td>0</td></tr><tr><td>Flammability (Red)</td><td>1</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></tbody></table></div>	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	1	Reactivity (Yellow)	0
Category	Classification								
Health Hazard (Blue)	0								
Flammability (Red)	1								
Reactivity (Yellow)	0								
<div>7. CHEMICAL REACTIVITY</div> <div>7.1 Reactivity With Water: No reaction</div> <div>7.2 Reactivity with Common Materials: No reaction</div> <div>7.3 Stability During Transport: Stable</div> <div>7.4 Neutralizing Agents for Acids and Caustics: Not pertinent</div> <div>7.5 Polymerization: Not pertinent</div> <div>7.6 Inhibitor of Polymerization: Not pertinent</div> <div>7.7 Molar Ratio (Reactant to Product): Data not available</div> <div>7.8 Reactivity Group: 34</div>	<div>12. PHYSICAL AND CHEMICAL PROPERTIES</div> <div>12.1 Physical State at 15°C and 1 atm: Liquid</div> <div>12.2 Molecular Weight: 390.6</div> <div>12.3 Boiling Point at 1 atm: 727°F = 386°C = 659°K</div> <div>12.4 Freezing Point: Not pertinent</div> <div>12.5 Critical Temperature: Not pertinent</div> <div>12.6 Critical Pressure: Not pertinent</div> <div>12.7 Specific Gravity: 0.980 at 25°C (liquid)</div> <div>12.8 Liquid Surface Tension: (est.) 15 dynes/cm = 0.015 N/m at 20°C</div> <div>12.9 Liquid Water Interfacial Tension: (est.) 30 dynes/cm = 0.03 N/m at 20°C</div> <div>12.10 Vapor (Gas) Specific Gravity: Not pertinent</div> <div>12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent</div> <div>12.12 Latent Heat of Vaporization: Not pertinent</div> <div>12.13 Heat of Combustion: —15,130 Btu/lb = —8410 cal/g = —352 x 10<sup>3</sup> J/kg</div> <div>12.14 Heat of Decomposition: Not pertinent</div> <div>12.15 Heat of Solution: Not pertinent</div> <div>12.16 Heat of Polymerization: Not pertinent</div> <div>12.25 Heat of Fusion: Data not available</div> <div>12.26 Limiting Value: Data not available</div> <div>12.27 Reid Vapor Pressure: Low</div>								
<div>8. WATER POLLUTION</div> <div>8.1 Aquatic Toxicity: Data not available</div> <div>8.2 Waterfowl Toxicity: Data not available</div> <div>8.3 Biological Oxygen Demand (BOD): Data not available</div> <div>8.4 Food Chain Concentration Potential: None</div>									
<div>9. SHIPPING INFORMATION</div> <div>9.1 Grades of Purity: Data not available</div> <div>9.2 Storage Temperature: Ambient</div> <div>9.3 Inert Atmosphere: No requirement</div> <div>9.4 Venting: Open (flame arrester)</div>									
<div>NOTES</div>									

DOP

## DIOCTYL PHTHALATE

12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F (estimate)	Temperature (degrees F)	British thermal unit-inch per hour- square foot-F	Temperature (degrees F)	Centipoise (estimate)
34	62.350	32	.478	45	.944	32	15.670
36	62.280	34	.478	50	.942	34	14.770
38	62.210	36	.478	55	.940	36	13.920
40	62.150	38	.478	60	.939	38	13.140
42	62.080	40	.478	65	.937	40	12.400
44	62.010	42	.478	70	.935	42	11.700
46	61.940	44	.478	75	.933	44	11.060
48	61.870	46	.478	80	.931	46	10.450
50	61.800	48	.478	85	.929	48	9.678
52	61.730	50	.478	90	.927	50	9.343
54	61.660	52	.478	95	.925	52	8.841
56	61.590	54	.478	100	.924	54	8.370
58	61.520	56	.478	105	.922	56	7.927
60	61.450	58	.478	110	.920	58	7.511
62	61.380	60	.478	115	.918	60	7.119
64	61.310	62	.478	120	.916	62	6.751
66	61.240	64	.478	125	.914	64	6.404
68	61.170	66	.478	130	.912	66	6.078
70	61.100	68	.478	135	.911	68	5.770
72	61.040	70	.478	140	.909	70	5.481
74	60.970	72	.478	145	.907	72	5.207
76	60.900	74	.478	150	.905	74	4.950
78	60.830	76	.478	155	.903	76	4.707
80	60.760			160	.901		
82	60.690			165	.899		
84	60.620			170	.897		

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77.02	.005	340	.006	340	.00026		N
		345	.007	345	.00030		O
		350	.008	350	.00036		T
		355	.009	355	.00041		
		360	.011	360	.00048		P
		365	.013	365	.00056		E
		370	.015	370	.00064		R
		375	.017	375	.00074		T
		380	.020	380	.00086		I
		385	.023	385	.00099		N
		390	.026	390	.00113		E
		395	.031	395	.00130		N
		400	.035	400	.00149		T
		405	.040	405	.00170		
		410	.046	410	.00194		
		415	.053	415	.00222		
		420	.061	420	.00252		
		425	.070	425	.00287		
		430	.080	430	.00325		
		435	.091	435	.00369		
		440	.103	440	.00417		
		445	.117	445	.00471		

## ETHYL BENZENE

CAS #:	100-41-4	ACGIH TLV:	100 ppm / 435 mg/M3
MOL. WT:	106.18	ACGIH STEL:	125 ppm / 545 mg/M3
CONC IDLH:	2000 ppm	OSHA PEL:	100 ppm / 435 mg/M3
NIOSH REL:	no data		

### DESCRIPTION

Physical: Colorless liquid with a sweet, gasoline-like odor  
Odor: aromatic  
Odor Threshold: 140 ppm

### CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	276.8 F	136 C	Vapor Pressure:	10 mm @ 25.9 C
Melting Point:	-139 F	-95 C	Ionization Potential:	8.76
Flash Point:	69.9 F	21.11 C	Upper Explosion Limit:	6.7%
Solubility:	0.015%		Lower Explosion Limit:	1.0%

**INCOMPATIBILITIES:** Strong oxidizers

### ROUTES OF EXPOSURE

Target Organs: eyes, upper resp sys, skin, CNS  
Health Hazards: May be poisonous if swallowed or absorbed through skin.  
Vapors may cause dizziness or suffocation.  
Fire may produce irritating or poisonous gases.  
Runoff from fire control or dilution water may cause pollution.

### SYMPTOMS OF OVEREXPOSURE

Inhalation may cause irritation of nose, dizziness, depression. Moderate irritation of eye with corneal injury possible. Irritates skin and may cause blisters.

### FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

### NFPA RATINGS

Health Hazard (Blue): (2)hazardous to health; area may be entered with self-contained breathing apparatus  
Flammability (Red): (3)material can be ignited under almost all temperature conditions  
Reactivity (Yellow): (0)stable even under fire conditions  
Special: no data

## NAPHTHALENE

CAS #:	91-20-3	ACGIH TLV:	10 ppm / 50 mg/M3
MOL. WT:	128.18	ACGIH STEL:	15 ppm / 75 mg/M3
CONC IDLH:	500 ppm	OSHA PEL:	10 ppm / 50 mg/M3
NIOSH REL:	no data		

### DESCRIPTION

Physical:	Colorless to brown solid or molten solid with an odor of mothballs; white crystalline volatile flakes
Odor:	mothball-like
Odor Threshold:	0.03 ppm

### CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	424.1 F	217.8 C	Vapor Pressure:	1 mm @ 52.6 C
Melting Point:	176 F	80 C	Ionization Potential:	8.14
Flash Point:	173.9 F	78.85 C	Upper Explosion Limit:	5.9%
Solubility:	0.003%		Lower Explosion Limit:	0.9%

**INCOMPATIBILITIES:** Strong oxidizers; incompatible with dinitrogen pentoxide; reacts violently with chlorine trioxide

### ROUTES OF EXPOSURE

Target Organs:	eyes, blood, liver, kidneys, skin, rbc, CNS
Health Hazards:	Contact may cause burns to skin and eyes. Fire may produce irritating or poisonous gases. Runoff from fire control or dilution water may cause pollution.

### SYMPTOMS OF OVEREXPOSURE

Vapors or fumes are irritating to eyes, nose, and throat and may cause headaches, dizziness, nausea, etc. Solid may be irritating to skin.

### FIRST AID

Move victim to fresh air and call emergency medical care. In case of contact, immediately flush eyes or skin with running water for at least 15 minutes. Removal of solidified molten material from skin requires medical assistance. Remove and isolate contaminated clothing and shoes at the site.

### NFPA RATINGS

Health Hazard (Blue):	(2)hazardous to health; area may be entered with self-contained breathing apparatus
Flammability (Red):	(2)material must be moderately heated before ignition will occur
Reactivity (Yellow):	(0)stable even under fire conditions
Special:	no data



# POLYCHLORINATED BIPHENYL

PCB

Common Synonyms PCB Chlorinated biphenyl Arochlor Halogenated waxes Polychlorobiphenyls		Only liquid to solid powder  Sinks in water	Light yellow liquid, or white powder	Weak odor
Stop discharge if possible. Keep people away. Avoid contact with liquid and solid. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire		Combustible Extinguish with water, foam, dry chemical, or carbon dioxide		
Exposure		CALL FOR MEDICAL AID  LIQUID OR SOLID Irritating to skin and eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes.  Notify local health and wildlife officials. Notify operators of nearby water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-water contaminant. Should be removed. Chemical and physical treatment.		2. LABEL 2.1 Category: None 2.2 Class: Not pertinent		
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Not listed 3.2 Formula: (C <sub>12</sub> H <sub>10</sub> ) <sub>n</sub> Cl <sub>n</sub> 3.3 IMO/UN Designation: Not listed 3.4 DOT ID No.: 2315 3.5 CAS Registry No.: 1336-36-3		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid or solid 4.2 Color: Pale yellow (liquid), colorless (solid) 4.3 Odor: Practically odorous		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Gloves and protective garments 5.2 Symptoms Following Exposure: Acne from skin contact. 5.3 Treatment of Exposure: SKIN: wash with soap and water. 5.4 Threshold Limit Value: 0.5 to 1.0 mg/m <sup>3</sup> 5.5 Short Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2, oral rat LD <sub>50</sub> = 3980 mg/kg 5.7 Late Toxicity: Causes chromosomal abnormalities in rats, birth defects in birds 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and cause eye and lung injury. They cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Contact with skin may cause irritation. 5.10 Odor Threshold: Data not available 5.11 IDLH Value: 5 to 10 mg/m <sup>3</sup>				
6. FIRE HAZARDS 6.1 Flash Point: >266°F 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Irritating gases are generated in fires. 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available				
7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: Data not available				
8. WATER POLLUTION 8.1 Aquatic Toxicity: 0.278 ppm/96 hr/bluegill/TL <sub>50</sub> /fresh water 0.005 ppm/336-1080 hr/pinfish/TL <sub>50</sub> /salt water 8.2 Waterfowl Toxicity: LD <sub>50</sub> 2000 ppm (mallard duck) 8.3 Biological Oxygen Demand (BOD): Very low 8.4 Food Chain Concentration Potential: High				
9. SHIPPING INFORMATION 9.1 Grades of Purity: 11 grades (some liquid, some solids) which differ primarily in their chlorine content (20%-68% by weight) 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open				
10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) II				
11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: ORM-E 11.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: Not listed				
12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Solid 12.2 Molecular Weight: Not pertinent 12.3 Boiling Point at 1 atm: Very high 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 1.3—1.8 at 20°C (liquid) 12.8 Liquid Surface Tension: Not pertinent 12.9 Liquid Water Interfacial Tension: Not pertinent 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: Not pertinent 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available				
NOTES				

PCB	POLYCHLORINATED BIPHENYL
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12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot (estimate)	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit-inch per hour- square foot-F	Temperature (degrees F)	Centipoise
68	81.150		N		N		N
69	81.150		O		O		O
70	81.150		T		T		T
71	81.150						
72	81.150		P		P		P
73	81.150		E		E		E
74	81.150		R		R		R
75	81.150		T		T		T
76	81.150		I		I		I
77	81.150		N		N		N
78	81.150		E		E		E
79	81.150		N		N		N
80	81.150		T		T		T
81	81.150						
82	81.150						
83	81.150						
84	81.150						
85	81.150						

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I		N		N		N
	N		O		O		O
	S		T		T		T
	O						
	L		P		P		P
	U		E		E		E
	B		N		N		N
	L		T		T		T
	E						

# SODIUM

SDU

Common Synonyms		Soft solid under kerosene	Silver to grayish-white	Odorless
		Floats and reacts violently with water. Flammable gas is produced.		
AVOID CONTACT WITH SOLID. Keep people away. Call fire department. Wear goggles, and rubber overclothing (including gloves). Notify local health and pollution control agencies.				
Fire	FLAMMABLE FIRE MAY START ON CONTACT WITH AIR. Flammable gas formed on contact with water or moisture. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). DO NOT USE WATER, CARBON DIOXIDE, OR VAPORIZING LIQUIDS. Extinguish with dry graphite, soda ash, powdered sodium chloride or other approved dry powder.			
Exposure	CALL FOR MEDICAL AID. SOLID Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.			
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Restrict access Evacuate area Chemical and physical treatment		2. LABEL 2.1 Category: Flammable solid; dangerous when wet 2.2 Class: 4		
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Not listed 3.2 Formula: Na 3.3 IMO/UN Designation: 4.3/1428 3.4 DOT ID No.: 1428 3.5 CAS Registry No.: 7440-23-5		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Soft solid or liquid 4.2 Color: Silvery white, changing to gray on exposure to air 4.3 Odor: Odorless		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Maximum protective clothing; goggles and face shield 5.2 Symptoms Following Exposure: Severe burns caused by burning metal or by caustic soda formed by reaction with moisture on skin 5.3 Treatment of Exposure: SKIN: brush off any metal, then flood with water for at least 15 min., treat as heat or caustic burn, call a doctor 5.4 Threshold Limit Value: Data not available 5.5 Short Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Not pertinent 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Non-volatile 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes. 5.10 Odor Threshold: Not pertinent 5.11 IDLH Value: Data not available				

6. FIRE HAZARDS		10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) RR-C	
6.1 Flash Point: Not pertinent		11. HAZARD CLASSIFICATIONS	
6.2 Flammable Limits in Air: Not pertinent			
6.3 Fire Extinguishing Agents: Dry soda ash, graphite, salt, or other approved dry powder such as dry limestone.			
6.4 Fire Extinguishing Agents Not to be Used: Water, carbon dioxide or halogenated extinguishing agents.			
6.5 Special Hazards of Combustion Products: Fumes of burning Na are highly irritating to skin, eyes, and mucous membranes.			
6.6 Behavior in Fire: Not pertinent			
6.7 Ignition Temperature: 250°F			
6.8 Electrical Hazard: Not pertinent			
6.9 Burning Rate: Not pertinent			
6.10 Adiabatic Flame Temperature: Data not available			
(Continued)			
7. CHEMICAL REACTIVITY			
7.1 Reactivity With Water: Reacts violently, with formation of flammable hydrogen gas and caustic soda solution. A fire often occurs.		12. PHYSICAL AND CHEMICAL PROPERTIES	
7.2 Reactivity with Common Materials: No reaction.			
7.3 Stability During Transport: Stable.			
7.4 Neutralizing Agents for Acids and Caustics: After reaction with water, caustic soda formed can be diluted with water and/or neutralized with acetic acid.			
7.5 Polymerization: Not pertinent.			
7.6 Inhibitor of Polymerization: Not pertinent.			
7.7 Molar Ratio (Reactant to Product): Data not available.			
7.8 Reactivity Group: Data not available.			
8. WATER POLLUTION			
8.1 Aquatic Toxicity: Not pertinent.		12.1 Physical State at 15°C and 1 atm: Solid	
8.2 Waterfowl Toxicity: Not pertinent.		12.2 Molecular Weight: 22.49	
8.3 Biological Oxygen Demand (BOD): None.		12.3 Boiling Point at 1 atm: 1621°F = 883°C = 1156°K	
8.4 Food Chain Concentration Potential: None.		12.4 Freezing Point: 207.5°F = 97.5°C = 370.7°K	
		12.5 Critical Temperature: 3632°F = 2000°C = 2273°K	
		12.6 Critical Pressure: 5040 psia = 343 atm = 34.8 MN/m²	
		12.7 Specific Gravity: 0.971 at 20°C (solid)	
		12.8 Liquid Surface Tension: Not pertinent.	
		12.9 Liquid Water Interfacial Tension: Not pertinent.	
		12.10 Vapor (Gas) Specific Gravity: Not pertinent.	
		12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent.	
		12.12 Latent Heat of Vaporization: Not pertinent.	
		12.13 Heat of Combustion: Not pertinent.	
		12.14 Heat of Decomposition: Not pertinent.	
		12.15 Heat of Solution: Not pertinent.	
		12.16 Heat of Polymerization: Not pertinent.	
		12.25 Heat of Fusion: 27.4 cal/g	
		12.26 Limiting Value: Data not available.	
		12.27 Reid Vapor Pressure: Data not available.	
9. SHIPPING INFORMATION			
9.1 Grades of Purity: Commercial grade 99.95%			
9.2 Storage Temperature: 230°—250°F (liquid), ambient (solid)			
9.3 Inert Atmosphere: Dry nitrogen or argon (for liquid), under kerosene (for solid)			
9.4 Venting: Pressure-vacuum			
6. FIRE HAZARDS (Continued)			
6.11 Stoichiometric Air to Fuel Ratio: Data not available			
6.12 Flame Temperature: Data not available			

SDU	SODIUM
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12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit-inch per hour- square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

## TOLUENE

CAS #:	108-88-3	ACGIH TLV:	50 ppm / 188 mg/M3
MOL. WT:	92	ACGIH STEL:	no data
CONC IDLH:	2000 ppm	OSHA PEL:	200 ppm
NIOSH REL:	100 ppm / 375 mg/M3		

### DESCRIPTION

Physical: Colorless watery liquid with a pleasant odor  
Odor: strong, pleasant  
Odor Threshold: 40 ppm

### CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	230.8 F	110.4 C	Vapor Pressure:	36.7 mm @ 30 C
Melting Point:	-139.3 F	-95.2 C	Ionization Potential:	8.82
Flash Point:	40 F	4.45 C	Upper Explosion Limit:	7.1%
Solubility:	0.05%		Lower Explosion Limit:	1.3%

**INCOMPATIBILITIES:** Strong ox

### ROUTES OF EXPOSURE

Target Organs: CNS, liver, kidneys, skin, eyes  
Health Hazards: May be poisonous if inhaled or absorbed through skin.  
Vapors may cause dizziness or suffocation.  
Contact may irritate or burn skin and eyes.  
Fire may produce irritating or poisonous gases.  
Runoff from fire control or dilution water may cause pollution.

### SYMPTOMS OF OVEREXPOSURE

Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested causes vomiting, griping, diarrhea, depressed respiration.

### FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

### NFPA RATINGS

Health Hazard (Blue): (2)hazardous to health; area may be entered with self-contained breathing apparatus  
Flammability (Red): (3)material can be ignited under almost all temperature conditions  
Reactivity (Yellow): (0)stable even under fire conditions  
Special: no data

TCE	TRICHLOROETHANE
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12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit-inch per hour- square foot-F	Temperature (degrees F)	Centipoise
0	85.419	55	.240		N	15	1.363
10	84.870	60	.242		O	20	1.295
20	84.309	65	.244		T	25	1.231
30	83.759	70	.246			30	1.172
40	83.200	75	.248		P	35	1.117
50	82.650	80	.250		E	40	1.065
60	82.089	85	.252		R	45	1.017
70	81.540	90	.254		T	50	.972
80	80.981	95	.256		I	55	.929
90	80.429	100	.258		N	60	.889
100	79.870	105	.260		E	65	.852
110	79.320	110	.262		N	70	.817
120	78.759	115	.264		T	75	.784
130	78.209	120	.266			80	.753
140	77.650	125	.268			85	.723
150	77.099	130	.270				
160	76.540	135	.272				
		140	.274				

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68.02	.070	70	2.099	70	.04925	0	.146
		75	2.364	75	.05495	25	.150
		80	2.657	80	.06119	50	.155
		85	2.980	85	.06799	75	.159
		90	3.335	90	.07540	100	.163
		95	3.725	95	.08346	125	.167
		100	4.152	100	.09220	150	.171
		105	4.619	105	.10170	175	.175
		110	5.130	110	.11190	200	.179
		115	5.686	115	.12300	225	.183
		120	6.292	120	.13490	250	.186
		125	6.950	125	.14770	275	.190
		130	7.663	130	.16150	300	.193
		135	8.437	135	.17630	325	.196
		140	9.273	140	.19220	350	.199
		145	10.180	145	.20920	375	.202
		150	11.150	150	.22730	400	.205
		155	12.200	155	.24670	425	.208
		160	13.330	160	.26730	450	.210
		165	14.540	165	.28930	475	.213
		170	15.840	170	.31270	500	.215
		175	17.240	175	.33760	525	.217
		180	18.730	180	.36390	550	.219
		185	20.330	185	.39180	575	.222
		190	22.030	190	.42140	600	.223

# TRICHLOROETHANE

TC

Common Synonyms 1,1,1-Trichloroethane Methylchloroform Aerodrene Chlorothene		Watery liquid  Sinks in water. Irritating vapor is produced.	Colorless  Sweet odor
Stop discharge if possible. Keep people away. Avoid contact with liquid and vapor. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies			
Fire	Combustible POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, carbon dioxide, or foam.		
Exposure	CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. If swallowed, may produce nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.  Notify local health and wildlife officials Notify operators of nearby water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Should be removed Chemical and physical treatment		2. LABEL 2.1 Category: None 2.2 Class: Not pertinent	
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Halogenated hydrocarbon 3.2 Formula: CH <sub>2</sub> CCl <sub>3</sub> 3.3 IMO/UN Designation: Not listed 3.4 DOT ID No.: 2831 3.5 CAS Registry No.: 71-55-6		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Chloroform-like, sweetish	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic vapor-acid gas canister; self-contained breathing apparatus for emergencies; neoprene or polyvinyl-alcohol-type gloves, chemical safety goggles and face shield, neoprene safety shoes (or leather safety shoes plus neoprene footwear); neoprene or polyvinyl alcohol suit or apron for splash protection. 5.2 Symptoms Following Exposure: INHALATION: symptoms range from loss of equilibrium and incoordination to loss of consciousness; high concentration can be fatal due to simple asphyxiation combined with loss of consciousness. INGESTION: produces effects similar to inhalation and may cause some feeling of nausea. EYES: slightly irritating and lachrymatory. SKIN: defatting action may cause dermatitis. 5.3 Treatment of Exposure: Get medical attention for all eye exposures and any other serious over-exposures. Do NOT administer adrenalin or epinephrine; otherwise, treatment is symptomatic. INHALATION: remove victim to fresh air; if necessary, apply artificial respiration and/or administer oxygen. INGESTION: have victim drink water and induce vomiting. EYES: flush thoroughly with water. SKIN: remove contaminated clothing and wash exposed area thoroughly with soap and warm water. 5.4 Threshold Limit Value: 350 ppm 5.5 Short Term Inhalation Limits: 1,000 ppm for 60 min. in man 5.6 Toxicity by Ingestion: Grade 1; LD <sub>50</sub> = 5 to 15 g/kg (rat, mouse, rabbit, guinea pig) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 100 ppm 5.11 IDLH Value: 1,000 ppm			

<div>6. FIRE HAZARDS</div> <div><div>6.1 Flash Point: Data not available</div><div>6.2 Flammable Limits in Air: 7%-16%</div><div>6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide</div><div>6.4 Fire Extinguishing Agents Not to be Used: Not pertinent</div><div>6.5 Special Hazards of Combustion Products: Toxic and irritating gases are generated in fire.</div><div>6.6 Behavior in Fire: Not pertinent</div><div>6.7 Ignition Temperature: 932°F</div><div>6.8 Electrical Hazard: Not pertinent</div><div>6.9 Burning Rate: (est.) 2.9 mm/min.</div><div>6.10 Adiabatic Flame Temperature: Data not available</div><div>6.11 Stoichiometric Air to Fuel Ratio: Data not available</div><div>6.12 Flame Temperature: Data not available</div></div>	<div>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-X-Y</div>																																				
<div>7. CHEMICAL REACTIVITY</div> <div><div>7.1 Reactivity With Water: Reacts slowly, releasing corrosive hydrochloric acid.</div><div>7.2 Reactivity with Common Materials: Corrodes aluminum, but reaction is not hazardous.</div><div>7.3 Stability During Transport: Stable</div><div>7.4 Neutralizing Agents for Acids and Caustics: Not pertinent</div><div>7.5 Polymerization: Not pertinent</div><div>7.6 Inhibitor of Polymerization: Not pertinent</div><div>7.7 Molar Ratio (Reactant to Product): Data not available</div><div>7.8 Reactivity Group: 36</div></div>	<div>11. HAZARD CLASSIFICATIONS</div> <div><div>11.1 Code of Federal Regulations: ORM-A</div><div>11.2 NAS Hazard Rating for Bulk Water Transportation: <table><thead><tr><th>Category</th><th>Rating</th></tr></thead><tbody><tr><td>Fire</td><td>1</td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td>1</td></tr><tr><td>Liquid or Solid Irritant</td><td>1</td></tr><tr><td>Poisons</td><td>2</td></tr><tr><td>Water Poison</td><td></td></tr><tr><td>Human Toxicity</td><td>1</td></tr><tr><td>Aquatic Toxicity</td><td>3</td></tr><tr><td>Aesthetic Effect</td><td>2</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td>1</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>0</td></tr></tbody></table></div><div>11.3 NFPA Hazard Classification: <table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazard (Blue)</td><td>2</td></tr><tr><td>Flammability (Red)</td><td>1</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></tbody></table></div></div>	Category	Rating	Fire	1	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Poison		Human Toxicity	1	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	1	Reactivity (Yellow)	0
Category	Rating																																				
Fire	1																																				
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Flammability (Red)	1																																				
Reactivity (Yellow)	0																																				
<div>8. WATER POLLUTION</div> <div><div>8.1 Aquatic Toxicity: 75-150 ppm/**prnfish/TL<sub>50</sub>/salt water *Time period not specified.</div><div>8.2 Waterfowl Toxicity: Data not available</div><div>8.3 Biological Oxygen Demand (BOD): Data not available</div><div>8.4 Food Chain Concentration Potential: None</div></div>	<div>12. PHYSICAL AND CHEMICAL PROPERTIES</div> <div><div>12.1 Physical State at 15°C and 1 atm: Liquid</div><div>12.2 Molecular Weight: 133.41</div><div>12.3 Boiling Point at 1 atm: 165°F = 74°C = 347°K</div><div>12.4 Freezing Point: &lt;-38°F = &lt;-39°C = &lt;234°K</div><div>12.5 Critical Temperature: Not pertinent</div><div>12.6 Critical Pressure: Not pertinent</div><div>12.7 Specific Gravity: 1.31 at 20°C (liquid)</div><div>12.8 Liquid Surface Tension: 25.4 dynes/cm = 0.0254 N/m at 20°C</div><div>12.9 Liquid Water Interfacial Tension: (est.) 45 dynes/cm = 0.045 N/m at 20°C</div><div>12.10 Vapor (Gas) Specific Gravity: 4.6</div><div>12.11 Ratio of Specific Heats of Vapor (Gas): 1.104</div><div>12.12 Latent Heat of Vaporization: 100 Btu/lb = 58 cal/g = 2.4 X 10<sup>4</sup> J/kg</div><div>12.13 Heat of Combustion: (est.) 4700 Btu/lb = 2600 cal/g = 110 X 10<sup>4</sup> J/kg</div><div>12.14 Heat of Decomposition: Not pertinent</div><div>12.15 Heat of Solution: Not pertinent</div><div>12.16 Heat of Polymerization: Not pertinent</div><div>12.25 Heat of Fusion: Data not available</div><div>12.26 Limiting Value: Data not available</div><div>12.27 Reid Vapor Pressure: 4.0 psia</div></div>																																				
<div>9. SHIPPING INFORMATION</div> <div><div>9.1 Grades of Purity: Uninhibited, inhibited; industrial inhibited, white room; cold cleaning</div><div>9.2 Storage Temperature: Ambient</div><div>9.3 Inert Atmosphere: No requirement</div><div>9.4 Venting: Pressure-vacuum</div></div>																																					
<div>NOTES</div>																																					

MGX	MAGNESIUM
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12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit-inch per hour- square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# MAGNESIUM

MGX

Common Synonyms	Solid	Silvery	Odorless
	Sinks in water.		
Call fire department. Stop discharge if possible. Keep people away. Isolate and remove discharged material. Notify local health and pollution control agencies.			
Fire	FLAMMABLE Extinguish with dry graphite, soda ash, or other inert powder. DO NOT USE WATER, FOAM, CARBON DIOXIDE, DRY		
Exposure	CALL FOR MEDICAL AID SOLID Irritating to eyes. Harmful if swallowed. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability. Should be removed. Chemical and physical treatment.		2. LABEL 2.1 Category: Flammable solid, dangerous when wet. 2.2 Class: 4.	
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Not listed 3.2 Formula: Mg 3.3 IMO/UN Designation: Pellets, turnings, or ribbon; 4.1/1869, powder, non-pyrophoric; 4.3/1418 3.4 DOT ID No.: 1418 (powder), 1869 (pellets) 3.5 CAS Registry No.: 7439-95-4		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Silvery; looks like aluminum 4.3 Odor: None	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Eye protection 5.2 Symptoms Following Exposure: Dust irritates eyes in same way as any foreign material. Penetration of skin by fragments of metal is likely to produce local irritation, blisters, and ulcers which may become infected. 5.3 Treatment of Exposure: EYES: flush with water to remove dust. SKIN: treat as any puncture. 5.4 Threshold Limit Value: Data not available 5.5 Short Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Oral LD <sub>50</sub> (lowest lethal dose) = 230 mg/kg (dog) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent 5.11 IDLH Value: Data not available			

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent (solid). Flammable when in the form of turnings or powder. 6.2 Flammable Limits in Air: Not pertinent. 6.3 Fire Extinguishing Agents: inert dry powders (e.g., graphite, limestone, salt). 6.4 Fire Extinguishing Agents Not to be Used: Water, foam, halogenated agents, carbon dioxide. 6.5 Special Hazards of Combustion: Products: Not pertinent. 6.6 Behavior in Fire: Forms dense white smoke. Flame is very bright. 6.7 Ignition Temperature: 883°F. 6.8 Electrical Hazard: Class I, Group E. 6.9 Burning Rate: Not pertinent. 6.10 Adiabatic Flame Temperature: Data not available.	10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) II
7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: In finely divided form, reacts with water and acids to release flammable hydrogen gas. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent. 7.7 Molar Ratio (Reactant to Product): Data not available. 7.8 Reactivity Group: Data not available.	11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Flammable solid. 11.2 HAS Hazard Rating for Bulk Water Transportation: Not listed. 11.3 NFPA Hazard Classification: Category Classification Health Hazard (Blue) _____ 0 Flammability (Red) _____ 1 Reactivity (Yellow) _____ 2
8. WATER POLLUTION 8.1 Aquatic Toxicity: None. 8.2 Waterfowl Toxicity: None. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: None.	12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Solid. 12.2 Molecular Weight: 24.3. 12.3 Boiling Point at 1 atm: 2,012°F = 1,100°C = 1,373°K. 12.4 Freezing Point: 1,202°F = 650°C = 923°K. 12.5 Critical Temperature: Not pertinent. 12.6 Critical Pressure: Not pertinent. 12.7 Specific Gravity: 1.74 at 20°C (solid). 12.8 Liquid Surface Tension: Not pertinent. 12.9 Liquid Water Interfacial Tension: Not pertinent. 12.10 Vapor (Gas) Specific Gravity: Not pertinent. 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 12.12 Latent Heat of Vaporization: Not pertinent. 12.13 Heat of Combustion: -11,950 Btu/lb = -6,550 cal/g = -278 X 10 <sup>3</sup> J/kg. 12.14 Heat of Decomposition: Not pertinent. 12.15 Heat of Solution: Not pertinent. 12.16 Heat of Polymerization: Not pertinent. 12.17 Heat of Fusion: 88.9 cal/g. 12.18 Limiting Value: Data not available. 12.19 Reid Vapor Pressure: Data not available.
9. SHIPPING INFORMATION 9.1 Grades of Purty: Pigs, ingots, turnings, sticks, all high purity. 9.2 Storage Temperature: Ambient. 9.3 Inert Atmosphere: No requirement. 9.4 Venting: Open (flame arrester).	6. FIRE HAZARDS (Continued) 6.11 Stoichiometric Air to Fuel Ratio: Data not available. 6.12 Flame Temperature: Data not available.

JUNE 1985

## XYLENE

CAS #:	1330-20-7	ACGIH TLV:	100 ppm / 435 mg/M3
MOL. WT:	106.18	ACGIH STEL:	150 ppm / 655 mg/M3
CONC IDLH:	1000 ppm	OSHA PEL:	100 ppm / 435 mg/M3
NIOSH REL:	100 ppm / 434 mg/M3		

## DESCRIPTION

Physical:	Colorless liquid with aromatic odor
Odor:	like benzene; characteristic aromatic
Odor Threshold:	0.05

## CHEMICAL/PHYSICAL PROPERTIES

Boiling Point:	281.9 F	138.8 C	Vapor Pressure:	6.7 mm @21 C
Melting Point:	-15.1 F	-26.2 C	Ionization Potential:	8.56
Flash Point:	80.9 F	27.2 C	Upper Explosion Limit:	7%
Solubility:	very sl sol		Lower Explosion Limit:	1%

**INCOMPATIBILITIES:** Strong oxidizers

## ROUTES OF EXPOSURE

Target Organs:	CNS, eyes, gi tract, blood, liver, kidneys, skin
Health Hazards:	May be poisonous if swallowed or absorbed through skin. Vapors may cause dizziness or suffocation. Contact may cause burns to skin and eyes. Fire may produce irritating or poisonous gases. Runoff from fire control or dilution water may cause pollution.

## SYMPTOMS OF OVEREXPOSURE

Dizziness, excitement, drowsiness, incoherence, staggering gait, irritated eyes, nose, throat, corneal vacuolization, anorexia, nausea, vomiting, abdominal pain, dermal irritation.

## FIRST AID

Move victim to fresh air and call emergency medical care. If not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

## NFPA RATINGS

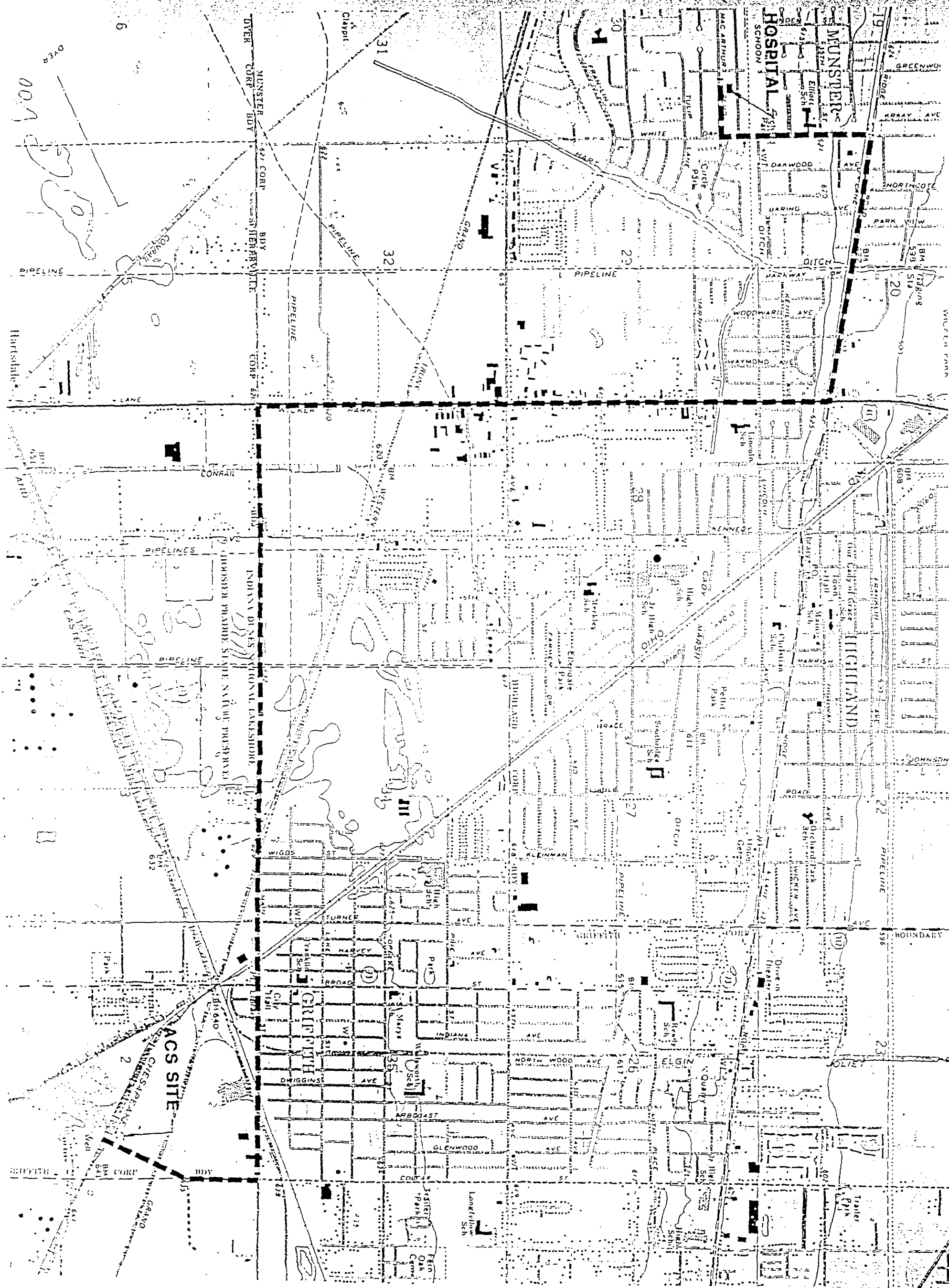
Health Hazard (Blue):	(2)hazardous to health; area may be entered with self-contained breathing apparatus
Flammability (Red):	(3)material can be ignited under almost all temperature conditions
Reactivity (Yellow):	(0)stable even under fire conditions
Special:	no data

C



C

SITE MAPS



SITE LOCATION MAP AND HOSPITAL ROUTE

AMERICAN CHEMICAL SERVICE INC.  
GRIFFITH, INDIANA

Developed By ACC

Drawn By TMS,ACC

Approved By

Date

Reference

Revisions

D



D

SEVERE WEATHER

# D

## SEVERE WEATHER

When projects are conducted outside, the potential for severe weather must be considered. Thunderstorms, tornados and winter storms can develop quickly, jeopardizing your safety. The following emergency procedures are to be followed in the event of severe weather.

### THUNDERSTORMS AND LIGHTNING

Monitor weather conditions at all times while working. At a sign of an impending storm - increased cloudiness, darkened skies, increased wind - listen to a radio for the latest weather information.

When a thunderstorm accompanied by lightning is in the project area, cease work immediately. All powered equipment, such as drill rigs, are to be shut down.

Seek shelter inside nearby buildings or trailers. If there are no buildings nearby, seek shelter inside your vehicle.

If you are caught outside, do not stand beneath tall, isolated trees or telephone poles. Avoid areas projecting above the landscape such as hill tops. In open areas, go to a low place such as a ravine or valley. Stay away from open water, metal equipment, wire fences and metal pipes. If you are in a group of people in the open, spread out, staying several yards apart.

If you are caught in a level field or open area far from shelter and you feel your hair stand on end, lightning may be about to strike you. Drop to your knees and bend forward, putting your hands on your knees. You should minimize the body area in direct contact with the ground. Do not lie flat on the ground.

If someone has been struck by lightning, monitor life signs and begin administering mouth-to-mouth resuscitation or cardiopulmonary resuscitation as needed. Send for help.



Check conscious victims for burns, especially at the fingers and toes and next to buckles and jewelry. Administer first aid for shock. Do not let the victim walk around.

## **TORNADOS**

Tornados usually develop from thunderstorms and normally occur at the trailing edge of the storm. Most tornados occur in the months of April, May, June, and July in the late afternoon and early evening hours.

When storms are predicted for the project area, monitor weather conditions on a radio. A tornado watch is issued when favorable conditions exist for the development of a tornado. A tornado warning is issued by the local weather service office whenever a tornado has actually been sighted or is strongly indicated by radar.

If a tornado warning is issued, seek shelter immediately. If there are permanent buildings located on site, go there immediately, moving toward interior hallways or small rooms on the lowest floor.

If a tornado warning is issued and you are in a vehicle or a site trailer, leave and go to the nearest building. If there are no buildings nearby, go in the nearest ditch, ravine or culvert, with your hands shielding your head.

If a tornado is sighted or a warning issued while you are in open country, lie flat in a ditch or depression. Hold onto something on the ground, such as a bush or wooden fence post, if possible.

Once a tornado has passed the site, site personnel are to assemble at the designated assembly area to determine if anyone is missing. Administer first aid and seek medical attention as needed.

## **WINTER STORMS**

When snow or ice storms are predicted for the project area, site personnel should monitor weather conditions on a radio. A winter storm watch is issued when a storm has formed and is approaching the area. A winter storm warning is issued when a storm is imminent and immediate action is to be taken.

When a storm watch is issued, monitor weather conditions and prepare to halt site activities. Notify the project manager of the situation. Seek shelter at site buildings or leave the site and seek warm shelter.

If you are caught in a severe winter storm while traveling, seek warm shelter if road conditions prevent safe travel.

If you are stranded in a vehicle during a winter storm:

- Stay in the vehicle. Disorientation comes quickly in blowing and drifting snow.
- Wait for help.
- Keep a window open an inch or so to avoid carbon monoxide poisoning.
- Run the engine and heater sparingly.
- Keep watch - do not let everyone sleep at the same time.
- Exercise occasionally.

F:\SAFETY\PLANS\STDAPP.WPD



E

TEMPERATURE STRESS

# E

## TEMPERATURE STRESS

This section outlines the signs and symptoms of temperature stress in addition to the engineering controls, work practice controls and other management techniques that should be used to reduce temperature stress. Individual susceptibilities to temperature stress need to be considered and used to pace the work being performed with the most susceptible person controlling the work/rest schedule. Monitoring for heat stress is to be performed as detailed in this section.

### COLD STRESS

#### **Reduction**

The following engineering controls are recommended for reduction of cold stress:

- Use general or spot heating to increase temperature at work site if this does not create a hazardous situation.
- Shield work area from wind.
- Cover metal handles of tools and equipment with thermal insulating materials.
- Do not sit on unprotected metal chair seats.
- Use heated rest areas if work is to be performed in an equivalent chill temperature of 20° F or below.

The following work practice controls are recommended to reduce cold stress:

- Drink warm, caffeine-free, sweet, non-alcoholic drinks or soup frequently.
- Schedule work for warmest part of the day.
- Use heated rest areas regularly.

- Use the buddy system. Do not work alone. Observe your co-workers for signs and symptoms of cold stress.
- Allow and encourage workers to pace themselves and take extra breaks when needed. The work schedule should be set by the person most susceptible to cold stress. Do not pressure someone to work beyond their capabilities.
- Whenever possible, allow new workers time to adjust to working in a cold environment before working full time. Ideally, acclimation should occur over five days: 20% Day 1 with a 20% increase on each successive day.
- When possible, arrange the work to minimize standing or sitting still for long periods of time.
- Reorganize work procedures so as much of a job as possible can be done in a warm environment.
- Avoid overtime.
- Remove outer layer of clothing when entering warm shelter.
- If clothes are wet, change to dry work clothes before returning to work in cold. If not possible, loosen clothing to facilitate evaporation of sweat.
- Develop and adhere to a work-rest schedule, using the guidelines which follow.

Air Temperature with Sunny Sky (degrees F)	Work/Break Schedule (minutes)				
	no wind	5 mph wind	10 mph wind	15 mph wind	20 mph wind
-15 to -19	110/10	110/10	75/10	55/10	40/10
-20 to -24	110/10	75/10	55/10	40/10	30/10
-25 to -29	75/10	55/10	40/10	30/10	cease
-30 to -34	55/10	40/10	30/10	cease	cease
-35 to -39	40/10	30/10	cease	cease	cease
-40 to -44	30/10	cease	cease	cease	cease
-45 & below	cease	cease	cease	cease	cease

#### Notes

1. These recommendations and guidelines are adapted from Threshold Limit Values and Biological Exposure Indices for 1993-1994, published by the American Conference of Governmental Industrial Hygienists, Cincinnati, OH.
2. 05 mph wind - light flag moves, 10 mph wind - light flag fully extended, 15 mph wind - raises newspaper sheet, 20 mph wind - blowing and drifting snow

The practicality of working under a work-rest schedule, together with the ability of the necessary equipment to function properly in cold weather, may be more restrictive than the health hazards and also need to be considered. The cold stress schedules noted above apply to moderate to heavy work activities. Light to moderate work activities can be moved down one level.

### **Signs and Symptoms**

Send a worker to warm shelter immediately if any of the following symptoms are noted:

- Heavy shivering
- Frostnip (skin turns white)
- Feeling of excessive fatigue
- Drowsiness
- Euphoria

### **First Aid**

Take victim to a warm area. Remove the outer layers of clothing. Gently warm the affected area, submerge it in tepid water if possible but do not rub. If there is evidence of frostbite, obtain medical attention immediately.

## **HEAT STRESS**

### **Reduction**

While site specific conditions need to be considered, the following guidelines are recommended to prevent or reduce the effects of heat stress.

- Develop and adhere to a work-rest schedule using the guidelines at the end of this section.
- Take breaks in cool areas.
- Drink fluids hourly. The fluids should be caffeine-free and non-alcoholic. Water or electrolyte-replacement drinks, such as Gatorade™, are good choices. Do not wait until you are thirsty. Your normal thirst mechanism is not sufficient to overcome the effects of dehydration. If you feel thirsty, you are already becoming dehydrated.
- Schedule work for the cooler part of the day -- early morning and/or early evening.
- Allow and encourage workers to pace themselves and take extra breaks when needed. The work schedule should be set by the person most susceptible to heat stress. Do not pressure someone to work beyond their capabilities.

- Whenever possible, allow new workers time to adjust to working in a hot environment before working full time. Ideally, acclimation should occur over five days: 20% Day 1 with a 20% increase on each successive day.
- Avoid overtime.
- Use the buddy system. Never work alone and watch your co-workers for signs of heat stress.

### Personal Monitoring

At each work break, count your pulse during a 30 second period as early as possible in the rest period.

- If your heart rates exceeds 110 beats per minute (BPM) at beginning of rest period, shorten your next work cycle by 1/3 and keep the rest period the same.
- If your heart rate still exceeds 110 BPM at that next rest period, shorten the following work cycle by 1/3.

At the beginning and end of each work shift, measure your weight,  $\pm 0.25$  LB, wearing similar clothes. You should not lose more than 1.5 % of your total body weight in a work day. If you do, drink fluids to compensate and to prevent dehydration.

A summary of recommended work breaks and personal monitoring schedule follows. These values apply to moderate work levels. For heavy work levels, apply monitoring schedule one level up. Light to sedentary work activities can be moved down one level if workers are acclimated and show no signs of heat stress.

Adjusted Temperature* (°F)	Heat Stress Monitoring (min)	
	Normal Work Clothes	Impermeable Work Clothes
above 90	45	15
88 to 90	60	30
83 to 87	90	60
77 to 82	120	90
72 to 78	150	120

\* Adjusted temperature = measured temperature + (13 x % sunshine)

Note

1. These recommendations and guidelines are adapted from Threshold Limit Values and Biological Exposure Indices for 1990-1991, published by the American Conference of Governmental Industrial Hygienists, Cincinnati, OH.



## **Signs and Symptoms**

- Heat rash
- Heat cramps: Muscle spasms; pain in hands, feet or abdomen
- Heat exhaustion: Pale, cool, moist skin; heavy sweating; dizziness; nausea; fainting
- Heat stroke: Red, hot, usually dry skin; lack of, or reduced, perspiration; nausea; dizziness; confusion; strong, rapid pulse; coma

## **First Aid**

Remove the affected individual's protective clothing and equipment. Wrap the victim in wet towels or clothing. If there are signs or symptoms of heat exhaustion or heat stroke, get medical attention immediately.

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## GENERAL HEALTH AND SAFETY RULES

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## GENERAL HEALTH AND SAFETY RULES

Certain rules and regulations apply to specific MW Operations. Personnel will follow these procedures when performing the specified tasks or work in the designated area.

### **SAFETY RULES WHEN WORKING NEAR HIGHWAYS OR CONSTRUCTION SITE TRAFFIC**

Set out traffic cones, warning signs, and flashers when performing field work in traffic areas. In traffic areas and on construction sites where heavy equipment is operating, wear luminous traffic vests.

Wear safety vests when working closer than 10 ft from a roadway.

Use safety signs when performing bridge and highway surveys and use warning lights on vehicles, as appropriate.

Let the construction equipment operators know you are around. Have "eye to eye" contact prior to setting up for a test.

Check the traffic pattern on construction projects before entering with a MW vehicle.

Stay away from the swing of the back-hoe bucket.

If practical, use your vehicle on a large site to divert construction traffic around the test area.

Park the testing vehicle between your work area and the operating equipment. Always work a significant distance behind your vehicle to allow for it being struck.

## **SAFETY RULES FOR HAZARDOUS WASTE SITES**

Smoking is not permitted at the site or in the site trailer.

Eating and drinking are only permitted in the support or clean zone.

Secure all loose equipment in the test vehicle which might "fly" when making sudden stops.

No open fires are allowed.

All employees handling hazardous waste samples or who may be exposed to hazardous or solid waste must be active participants in the medical surveillance program.

A respirator can not be worn when beards or any other facial hair interferes with the face-to-respirator seal. Individuals with such facial hair are not to be allowed to work in Level of Protection C or B.

Working alone on field sites is generally prohibited. The "buddy system" is to be enforced at all times unless the Health and Safety Coordinator (HSC) specifically exempts the work from his requirement, based on the HSC's review of site conditions and hazards. When working under the "buddy system", personnel are to:

- Never work alone
- Provide partner with assistance
- Observe partner for signs for overexposure/temperature stress
- Check integrity of partner's protection clothing
- Notify others if emergency help is needed

Personnel on site must use the buddy system when wearing respiratory protective equipment. Visual contact must be maintained between pairs on-site. Entry team members are to remain close together to assist each other during emergencies.

No "souvenirs" or samples not required for the project are to be collected.

Samples are to be placed in approved containers before they can be removed from the site. Only approved or designated vehicles can be used to transport samples.

Samples are to be left in the staging area. Samples are never to be brought into the office.

Field apparel that had not been decontaminated is not to be worn into the office.

Field samples are to be disposed properly.

Observe all safety signs and do not remove any "lockout tags" or other lockout devices.

Contact with contaminated or suspected contaminated surfaces is to be avoided.

Do not walk through puddles, discolored surface, kneel on the ground, or lean, sit, or place equipment on visibly stained surfaces.

Drums or tanks found on site are not to be opened or moved unless specific drum/tank remediation tasks are specifically included in the SSP and are fully implemented.

Use work schedules that minimize time spent in hazardous areas.

Use work assignments that place employees upwind of sources of air contaminants.

Post the Site Safety Plan, or have a copy readily available, for review by employees. Verify that all personnel have read and signed the SSP.

Notify the SSO of any unsafe acts or conditions or at the first indication that you experience temperature stress or signs and symptoms of possible chemical exposure.

## **LADDER SAFETY**

Ladders pose a significant hazard when improperly used or maintained. There are four causes of accidents involving ladders. They include:

- Improperly securing ladder top and/or bottom
- Structural failure of ladders
- Ascending or descending ladders improperly
- Carrying objectives when ascending or descending ladders

### **Step Ladders**

Step ladders must have positive locking spreaders which will fully spread and lock when the ladder is in use.

- Do not use a step ladder as a straight ladder.
- Do not use the top two steps of a step ladder.
- Do not climb the cross-bracing on the rear side of stepladders.

### **Straight Ladders**

Portable manufactured straight ladders will be used by MW. Job-built ladders require special regulations and will not be used by MW employees unless approval is given by the Health and Safety Manager.

- When portable ladders are used for access to an upper landing surface, the side rails must extend at least 3 feet above the upper landing surface. The ladder must be secured, and a grasping device, such as a grab rail, must be provided to assist workers in mounting and dismounting the ladder.
- Ladders must be maintained free of oil, grease, and other slipping hazards.
- Ladders must not be loaded beyond the maximum intended load for which they were built, nor beyond their manufacturer's rated capacity.
- Ladders must be used only for the purpose for which they were designed.
- Non-self-supporting ladders must be used at an angle where the horizontal distance from the top support to the foot of the ladder is approximately one-quarter of the working length of the ladder.
- Ladders must be used only on stable and level surfaces unless secured to prevent accidental movement.
- Ladders must not be used on slippery surfaces unless secured or provided with slip-resistant feet to prevent accidental movement. Slip-resistant feet must not be used as a substitute for the care in placing, lashing, or holding a ladder upon slippery surfaces.
- Ladders placed in areas such as passageways, doorways or driveways, or where they can be displaced by workplace activities or traffic, must be secured to prevent accidental movement, or a barricade must be used to keep traffic or activities away from the ladder.
- The area around the top and bottom of the ladders must be kept clear.
- Ladders must not be moved, shifted, or extended while in use.
- Ladders must have nonconductive siderails if they are used where the worker or the ladder could contact exposed energized electrical equipment.
- Ladders must be inspected by a competent person for visible defects on a periodic basis and after any incident that could affect their safe use.
- Single-rail ladders must not be used.
- When ascending or descending a ladder, the worker must face the ladder.
- Each worker must use at least one hand to grasp the ladder when moving up or down the ladder.

- A worker on a ladder must not carry any object or load that could cause the worker to lose balance and fall.

### **Other Procedures**

- Don't reach beyond a normal arm's length sideways when working on a ladder. A good rule of thumb is to "keep your belt buckle between the side rails." Move the ladder as often as necessary to get close to the work.
- When extending extension ladders, keep your hands on the rails, not the rungs to prevent injuring your hands. Be sure the interlocking guides and connecting mechanisms are set and securely latched.
- Tools should not be left hanging or dangling from ladders or ladder rungs.

## **FALL PROTECTION**

OSHA requires fall protection when the distance from a working surface to a lower level is more than six (6) feet. Fall protection may be required for distances less than six (6) feet if there are obstructions or other hazards present. The MW Site Safety Officer will be responsible for implementing fall protection procedures during field activities.

A fall protection system consists of four components - an anchorage point, a lanyard, a body support, and associated connectors.

### **Anchorage Point**

Anchorage points for fall protection systems must be able to withstand 5,400 lbs static load strength for a 6 ft fall or 3,000 lbs for a 2 ft or less fall. The anchorage point should be directly overhead of the worker to prevent horizontal swing in the event of a fall.

A horizontal lifeline is a cable rigged between two fixed anchorage points on the same level and independent of the work surface. Horizontal lifelines are used when there are no anchorage points above the work area. A horizontal lifeline system requires careful engineering and will not be used without authorization of the MW Health and Safety Manager.

### **Lanyards**

A lanyard is a short, flexible rope, or strap webbing used to connect a worker's safety harness to the anchorage point. Lanyards should have a minimum strength of 5,000 lbs and absorb the shock of a free fall of 6 ft or less. Shock absorbing lanyards are also available that absorb the energy of a free fall and decelerate the fall of the worker.



It is MW policy to purchase manufactured lanyards. Home made lanyards or ropes and tire-offs not allowed.

When attaching a lanyard to an anchorage point special crossover straps, or tie off adapters will be used. These are webbed straps with a D-ring on each end. The strap is looped around a pipe, beam or other anchor and the lanyard is anchored into both D-rings. Looping a lanyard around the anchor and hooking back onto itself is not permitted.

### **Self-Retracting Lifelines**

Self-retracting lifelines are portable devices which are fixed to an anchorage point above a work area and plays out or retracts line automatically as workers move away and toward the device. When a fall occurs, a locking device automatically arrests movement. This type of device should be used in conjunction with tripod/winch devices during confined space entry.

### **Body Harness**

A body harness is a web belt system designed to spread the shock from a fall over the entire body. A full body harness is required for all MW operations requiring fall protection systems. A body belt which is worn around the waist and chest harnesses are not permitted.

### **Hardware Connectors**

Hardware connectors consist of D-rings, snap-hooks and metal links used to connect fall protection systems together. Connectors should be corrosion-resistant and all surfaces and edges should be smooth to prevent damage to interfacing parts. D-rings and snap-hooks should be able to withstand 5,000 lbs static loads and 3,600 proof tested pounds without cracking, breaking or sustaining distortion.

MW policy is to only use snap-hooks with a positive locking device or spring loaded keeper which prevents "roll-out" or unintentional release of components.

### **Additional Requirements**

Lifelines, lanyards and harnesses should be protected from sharp edges or cutting edges such as along the edge of "I" beams. A webbing material should be used in these cases.

Knots reduce the strength of ropes, lanyards and cable by as much as 50%. Standard manufactured components will be used and employees will not use knots in fall protection systems.

A lanyard should not be connected to a harness and a deceleration device such as a retractable lifeline since the maximum fall distance of 6 ft maybe exceeded.

When work is performed in an aerial lift device such as a "cherry picker", workers must wear a harness and lanyard. The lanyard should be attached to the lift device bucket. Never attach the lanyard to anything outside the bucket.

Safety belts, lanyards and lifelines must only be used for employee protection. They are never to be used for lifting static loads.

Once used to arrest a fall, the fall protection equipment must be taken out of service and destroyed unless the equipment is inspected by the Site Safety Officer and deemed safe for reuse. Lanyards will always be destroyed after use. The SSO will document that the equipment was inspected and deemed safe for reuse in the field logbook.

### **Maintenance**

Wipe off surfaces of fall protection lanyards, harnesses and connectors to remove gross contamination. Materials can be cleaned with soap and water. A soft brush can be used to scrub the equipment. Hang freely to dry. Do not use solvents or abrasive materials to clean the equipment.

### **Inspections**

The SSO will inspect fall protection equipment each day before use. Document the inspection in field log books.

- Check lanyards for knots, cuts, fraying, chemical degradation. Rotate the lanyard and check the entire surface for damage. Make sure spliced connections are tight and secure.
- Inspect harness for damage including cuts, fraying, and chemical degradation. Make sure buckles and rings are not damaged.
- Inspect hooks for corrosion, dirt, and physical damage. All snap-hooks must fully close and lock. Visually check and physically test the hook. Do not rely on the sound of the hook closing.
- Inspect the tripod for damage. The unit should stand firmly when legs are extended. All bolts should be tight. Winch attachment bolts should be tight. Legs should not be bent and foot pads should be in place. Check winch to make sure ratchet system functions when crank is turned. Pull the line from the winch and make sure brake mechanism works properly.
- All broken, damaged or questionable lifelines, lanyards, harnesses and hooks should be taken out of service and be replaced.

Contact the Office Supervisor, Warehouse Coordinator or Health and Safety Manager if defective parts are found, Do Not Use Damaged Equipment.

## **NUCLEAR DENSITY GAUGE SAFETY**

Personnel who use nuclear density gauges (Troxler gauge) must follow specific procedures and regulations as required by MW's nuclear material license and the Nuclear Regulatory Commission (NRC). Gauges will be used, transported and stored according to these regulations.

The Troxler Nuclear Density Gauges emit two types of radiation which is a hazard for those working with the gauges.

### **Gamma Radiation**

Gamma radiation is a form of electromagnetic radiation, as are x-rays, radio waves, and visible light. Gamma rays have no mass, zero electrical charge, travel at the speed of light and are much more energetic and penetrating than visible light. The more penetrating gamma rays are able to pass through solids. Gamma rays originate from the product nucleus after radioactive decay and are characteristic of a particular disintegration scheme. The gamma ray emitted after the decay of Cesium-137 to Barium-137 in the Troxler gauges can be stopped by several inches of lead.

### **Neutron Radiation**

Neutron radiation used by Troxler gauges is produced by bombarding beryllium with the alpha particles produced by the decay of Americium-241. The interaction of an alpha particle with a beryllium atom produces an unstable isotope of carbon. The natural decay process that allows the carbon atom to reach a stable state requires the release of a neutron from the carbon nucleus.

The neutron, having no electrical charge, is very penetrating. The problem of shielding against neutrons is twofold: first they must be slowed down, then another material must be used to absorb the slowed neutrons. This slowing process, called thermalization, is best achieved by particles of the same mass as the neutron such as hydrogen. Water as well as other materials with high hydrogen content are ideal thermalizers. Boron and cadmium are particularly good thermal neutron absorbers. Therefore, shielding is accomplished by placing polyethylene, a material with a high hydrogen content, around the neutron source to thermalize the neutrons, allowing them to be absorbed by a thin cadmium sheet covering the polyethylene.

### **Exposure Limits**

Current OSHA allowable exposure limits are 5 rem/year - whole body. The NRC requires that the dose to an embryo fetus during an entire pregnancy be less than 0.5 rem. Women who use nuclear density gauges should declare their pregnancy to the Radiation Safety Officer (RSO) at the earliest possible date so that this exposure limit is not exceeded.

Staff certified to use the Troxler gauges will be issued radiation badges monthly. MW radiation badges measure gamma rays, beta particles, x rays and fast neutrons. Personnel who are not issued radiation badges will not be allowed to use the gauges. Landauer reports of radiation exposure are in millirems. 5,000 millirems = 5 rem annual exposure limit. Each quarter personnel with radiation badges will be given a copy of their exposure record.

## **PRINCIPLES OF RADIATION PROTECTION**

There are three factors that effect radiation exposure:

- Time - The less time a person remains in the area of radiation the less radiation dose received.
- Distance - The intensity of radiation falls off as the inverse square of the distance from the source. By moving twice as far from the source, exposure to radiation is reduced to 1/4 the level. Moving three times as far away reduces exposure to 1/9 the level.
- Shielding - Protective material placed between the user and the source reduces exposure. In the gauges, this is accomplished by keeping the sources in the "locked" or shielded position when not in use.

### **General Procedures**

- Never use or manipulate a gauge without proper training, knowledge, or authorization.
- Wear a radiation badge when working with a gauge.
- Advise other workers to stay clear when the gauge is in use.
- Only the manufacturer should attempt to repair the source, source holder, or shutter.
- Always lock the shutter in the "off" position until maintenance is completed.
- Avoid any physical contact with, or direct exposure to the source when performing maintenance.
- Clean the gauge once or twice a week to prevent dirt form getting near the shutter.
- If necessary, clean the area around the shutter throughout the day if conditions are extremely muddy.

- Make sure the gauges are leak tested every six months.
- Before storing, make sure the source is in the safe position.
- Lock the source and shutter in place.
- Never modify the source holder, shielding, or safety interlocks.
- Store the gauge in its case when not in use.
- Never leave the gauge unattended at a job site.
- Identify the case in case it is lost, damaged or misplaced.
- Lock the area where the gauge is stored.
- When taking a gauge to and from a job site, place it in its case and keep it in an unoccupied part of the vehicle. The case should be locked and chained to the vehicle. The chain should be locked as well.
- Ship according to DOT requirements.

## **WORKING NEAR WATER**

Employees working near water, where a danger of drowning exists will wear U.S. Coast Guard approved life jackets. The SSO will inspect life jackets before and after each use. Defective life jackets will be taken out of service and destroyed. When working from boats or barges ring buoys with at least 90 ft of line will be available for emergency use. A lifesaving skiff will be available when working from barges for rescue purposes.

## **ELECTRICAL SAFETY**

MW employees will not perform electrical installations or work on energized electrical equipment where "live" parts are exposed. Energized electrical equipment should be deenergized before performing maintenance.

### **Electrical Cords**

Electrical cords passing through work areas should be covered or elevated to protect the cord from damage and reduce hazards to employees.

Extension cords used with portable tools will be 3-wire type and will be protected from damage when in use. Extension cords must be inspected on a routine basis. Cords with cuts in the insulation or that are worn or frayed or have insulation pulled back from the plug or receptacle fittings will be taken out of service immediately.

### **Grounding**

Portable tools and other electrical equipment will be grounded or double insulated. Ground fault circuit interrupters (GFCIs) will be used in wet areas and on all field sites and outdoor operations. Extension cords used on field sites must always be used in conjunction with GFCIs.

## **HOT WORK**

Hot work involves the use open flames or other sources of heat around possible sources of flammable vapors. Hot work includes:

- Welding
- Burning or cutting with a torch or saw
- Grinding
- Using impact tools that create sparks
- Any other operation that is a potential ignition source in the presence of flammable vapors

These procedures are designed to control sources of ignition and reduce fire and/or explosion hazards of the operations.

Operations defined as hot work outlined above are not allowed unless they are expressly addressed under the scope of work in the health and safety plan. When hot work procedures are permitted under the scope of work, the SSO will be responsible for implementing fire control measures, they include:

- Designating a fire watcher to monitor hot work practices.
  - The fire watcher will monitor operations and have a fire extinguisher at the ready for emergencies. The fire watcher will know how to sound an alarm and how to evacuate the area.
  - Fire watchers cannot perform other tasks during hot work procedures.
  - Fire watchers should only try to extinguish fires that are within their capacity.
  - Fire watches should be maintained for at least one-half hour after a welding or cutting operations to detect and extinguish smoldering fires.

- Having the right type and size of fire extinguisher for the job in question.
- Using air monitoring equipment including combustible gas indicators and oxygen monitors to maintain explosive vapors at safe levels.
- Using necessary purging/inerting procedures to reduce accumulation of flammable vapors.

## **UNDERGROUND TANK (UST) REMOVAL**

The following general procedure will be used for UST removal.

### **Initial Preparation**

- Roads in the work area should be barricaded and caution tape or portable fencing used to limit access to the work area.
- Ignition sources will be removed from the work area. These include smoking, welding, all electrical equipment and internal combustion engines.
- A fire extinguisher of adequate type and size for the operation will be placed within 20 ft of operations.

Product lines should be disconnected and drained and pumps and electrical equipment removed and disconnected. The top of the tank should then be excavated. Tank contents will be removed by pumping with an explosion proof mechanical or pneumatic pump. Product will be placed in 55 gallon drums. The pump lines and hoses should be bonded to the UST and to the 55 gallon drum to prevent build-up of static charges.

### **Inerting/Purging**

Once the tanks are empty of free product, they will be inerted by placing dry ice through a fill pipe opening or by pumping nitrogen to the bottom of the tank. At least 1.5 pounds of dry ice per 100 gallons tank capacity is required. The dry ice should be crushed and evenly distributed (as much as possible) to promote rapid evaporation. As carbon dioxide or nitrogen displaces tank vapors, toxic vapors will be expelled through the vent. All other openings should be sealed to prevent air from entering the tank. Vapors should be vented 12 ft above grade by extending the vent pipe. An organic vapor monitor will be used to measure toxic vapor concentrations in the breathing zone of workers in the area. Oxygen and combustible gases will be monitored during the inerting process. When the oxygen level is less than 5%, the tanks will be excavated and staged for cleaning. (LEL readings will not be reliable when the tank is inerted due to insufficient oxygen for combustion.) Oxygen and LEL should be monitored frequently during all operations to ensure inert conditions are maintained. When taking readings,

drop a tube connected to the LEL/Oxygen meter into the tank and measure levels at the bottom, middle and upper tank levels.

An alternative method of purging involves placing an eductor-type air blower driven by an air compressor on the fill (drop) pipe to draw fresh air in through another tank opening. The blower must be installed on the drop pipe so vapors are removed from the bottom of the tank. Fresh air is drawn into the top of the tank at the other opening. The blower must be properly bonded to the tank and grounded to prevent the build-up of static charge.

### **Cutting**

To prepare for opening the tanks, each tank will be grounded by attaching conductive cable to the tank. The other end of the cable will be attached to a grounding rod driven into the ground. An abrasive chop saw or pneumatically driven rivet buster will be used to cut off both ends of the tanks. If the rivet buster is used, two operators are required to man the device. In addition, a fire spotter with the fire extinguisher at the ready is required until the tank cutting operation is completed. For smaller tanks, under 1,000 gallons, the entire end of the tank will be removed creating a square whose corners reach the edge of the tank. For larger tanks the opening must be at least 4 ft by 4 ft to prevent the tanks from being classified as a confined space. Monitor oxygen and LEL levels throughout the process to ensure inert or purged conditions are maintained. Add more dry ice or keep pumping nitrogen into the tank during cutting. If the eductor blower method of purging is used, the blower should be run continuously through the cutting operation.

### **Cleaning**

Once the ends of the tanks are removed, thus eliminating the tank as being classified as a confined space, personnel may enter to perform cleaning operations. Oxygen, LEL and organic vapors must be monitored before entry. If the tank was inerted with dry ice or nitrogen, the eductor blower will now be placed on the tank to purge these gases and bring oxygen levels to the acceptable range. Personnel will don Level C or Level B protection and clean the tank. Level C is used for fuel oils or diesel fuel. Level B is required when entering any tank that contained gasoline due to the possible presence of tetraethyl lead. The eductor blower will be in operation at all times during the cleaning process.

## **LIFTING/MATERIALS HANDLING**

Back injuries are a primary workplace safety problem. Common sense and preplanning can prevent most back injuries.

### **Material Handling**

- Inspect materials for silvers, jagged or sharp edges, burrs, rough or slippery surfaces.



- Grasp the object with a firm grip.
- Keep fingers from pinch and shear points, especially when setting materials down.
- Wipe off greasy, wet, slippery, or dirty objects before handling them.
- Keep hands free from oil and grease.
- Use leather or cloth gloves to protect hands.

### **Preparation For Lifting and Carrying**

Before starting to lift or carry anything, check your entire walkway to make sure your footing will be solid. Your shoes should give you good balance, support and traction.

- Clear any moveable obstacles out of the way, and make sure you know the location of immovable ones.
- Cautiously heft the object to be moved to check its weight and center of gravity.

### **Lifting Procedure**

- Get a firm footing. Keep your feet apart for a stable base; point toes out.
- Bend your knees. Don't bend at the waist. Keep the principals of leverage in mind. Don't do more work than you have to.
- Tighten your stomach muscles. Abdominal muscles support the spine offsetting the force of the load.
- Lift your legs. Let your powerful leg muscles do the work of lifting, not your weaker back muscles.
- Keep the load close. Don't hold the load away from your body. The closer it is to your spine, the less force it exerts on your back.
- Keep your back upright. Whether lifting or putting down the load; don't add the weight of your body to the load.

### **Safety Tips for Lifting**

- Don't lift objects over your head.
- Don't twist your body when lifting or setting an object down.

- Don't reach over an obstacle to lift a load. Move the obstacle or go around it.
- Pace yourself to avoid fatigue when doing heavy work for long periods.
- Use common sense.

### **Alternative To Lifting**

For difficult lifting tasks, keep the following in mind.

- Ask a co-worker for help.
- Use a cart or other material handling device.

Pushing a load is easier on the back than pulling it. When pushing a load:

- Stay close to the load.
- Don't lean forward.
- Use both arms.
- Keep the stomach muscles tight.

If you must pull something:

- Face the object squarely, with one foot at least 12 in. in front of the other.
- Keep your back straight.
- Bend your knees slightly.
- Pull with one smooth motion.

### **Shoveling**

General lifting procedures also apply to shoveling. Use the following procedure:

- Make sure your grip and balance are solid.
- Tighten your abdomen as you lift.
- Keep the shovel close to your body.
- Bend your knees not your back.
- Use the strength of the thighs to bring you to an upright position.
- Increase your leverage by keeping your bottom hand low and toward the shovel blade. This allows you to use the strength of your arms and shoulders instead of your back.



G

DECONTAMINATION

# G

## DECONTAMINATION

Everything leaving the exclusion zone must be decontaminated or properly discarded. The exclusion zone is to be defined in the Site Health and Safety plan. All personnel entering the exclusion zone must exit through the decontamination zone. All equipment is to be decontaminated and inspected before it is moved into the support zone. Decontamination solutions are to be appropriate for the hazards. Decontamination solutions are to be changed at least daily and stored on site until disposal arrangements are made. Any material generated by the decontamination procedures will be stored in a designated area in the exclusion zone until disposal arrangements are made.

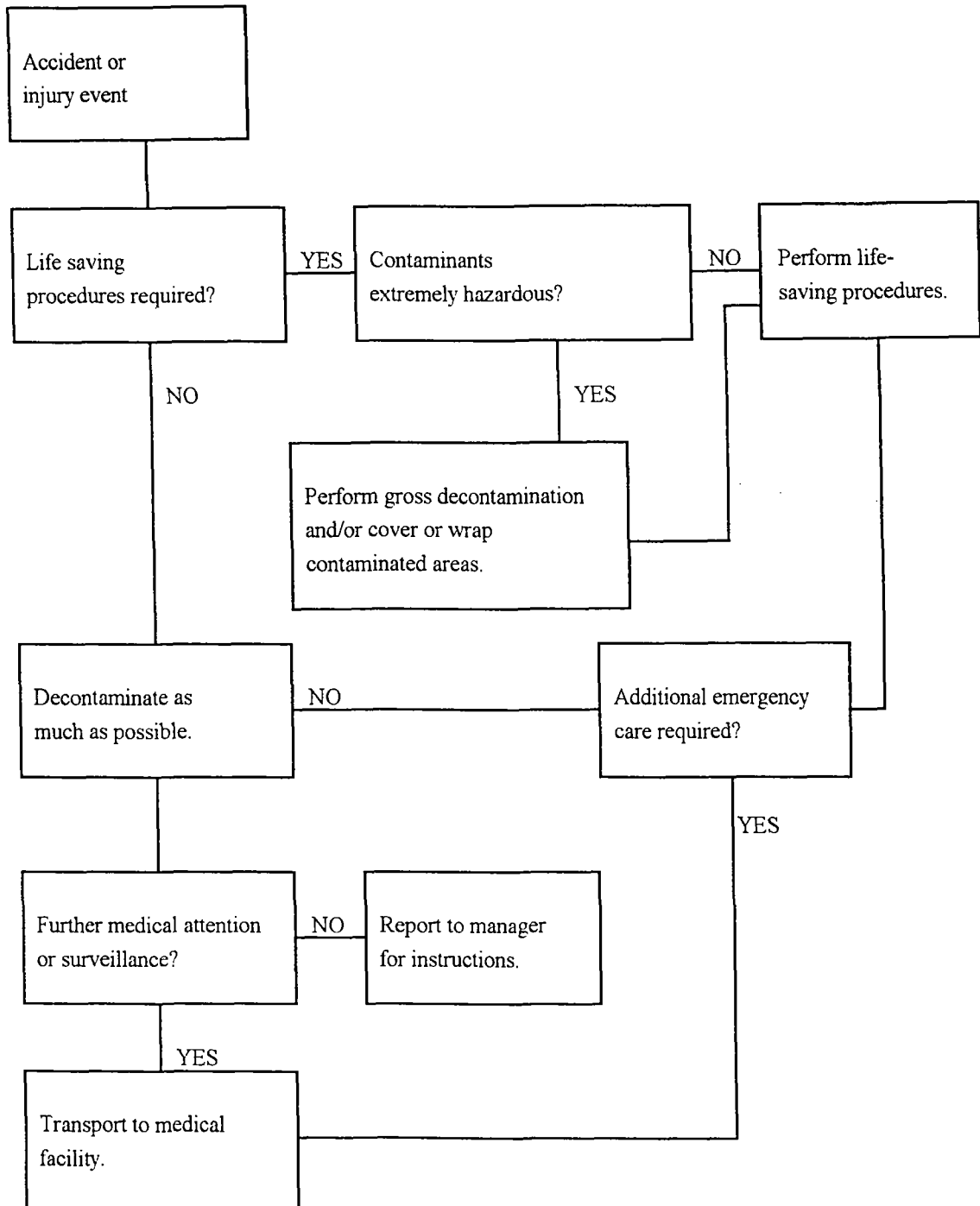
### EMERGENCY DECONTAMINATION

The need for emergency decontamination of an individual may arise as the result of:

- Injury or illness
- Overexposure to chemicals or hazardous substances
- Temperature stress

Primary consideration needs to be given to life-preservation actions and the minimization of additional harm or health risks to the individual in the emergency situation and the rescuing individuals.

## EMERGENCY DECISIONS



## **LEVEL B ROUTINE DECONTAMINATION**

### **Equipment Drop**

Deposit equipment used on site (tools, sampling devices, monitoring equipment, radios, etc.) on plastic drop cloths. Decontaminate or dispose of items before removal from exclusion zone.

### **Outer Boot/Glove Wash and Rinse**

Scrub outer boots/gloves with decontamination solution then rinse with water.

### **Outer Boot/Glove Removal**

Remove outer boots/gloves:

- If outer boots/gloves are disposable, deposit them in the appropriate plastic-lined container.
- If outer boots/gloves are not disposable, store them in a clean, dry place.

### **Outer Garment Removal**

If using self-contained breathing apparatus (SCBA), remove SCBA back pack and remain on air as long as possible. Remove chemical-protective outer garments and deposit in the appropriate container.

### **Respiratory Protection Removal**

Remove hard hat and face piece, and deposit on a clean surface. Wash and rinse hard hat and face piece. Wipe off and store face piece in a clean, dry location.

### **Inner Glove Removal**

Remove inner gloves and deposit in the appropriate container for disposal.

### **Field Wash**

Thoroughly wash hands and face with soap and water. Shower as soon as possible.

## **LEVEL B DECONTAMINATION FOR AIR TANK EXCHANGE**

### **Equipment Drop**

Deposit equipment used on site (tools, sampling devices, monitoring equipment, radios, etc.) on plastic drop cloths. Decontaminate or dispose of items before removal from exclusion zone.

### **Outer Boot/Glove Wash and Rinse**

Scrub outer boots/gloves with decontamination solution then rinse using water.

**Outer Boot/Glove Removal**

Remove outer boots/gloves:

- If outer boots/gloves are disposable, deposit them in the appropriate plastic-lined container.
- If outer boots/gloves not disposable, store them in a clean, dry place.

**Tank Change**

Exchange air tank. Don new outer boots/gloves. Tape joints and return to exclusion zone.

**LEVEL C ROUTINE DECONTAMINATION****Equipment Drop**

Deposit equipment used on site (tools, sampling devices, monitoring equipment, radios, etc.) on plastic drop cloths. Decontaminate or dispose of items before removal from exclusion zone.

**Outer Boot/Glove Wash and Rinse**

Scrub outer boots/gloves and/or splash suit with decontamination solution then rinse with water.

**Outer Boot/Glove Removal**

Remove outer boots/gloves:

- If outer boots/gloves are disposable, deposit in them in the appropriate plastic-lined container.
- If outer boots/gloves are not disposable, store them in a clean, dry place.

**Outer Garment Removal**

Remove chemical-protective outer garments and deposit them in the appropriate container.

**Respiratory Protection Removal**

Remove hard hat and respirator and deposit them on a clean surface. Discard respirator cartridges in the appropriate container. Wash and rinse hard hat and respirator. Wipe off and store respirator in a clean, dry location.

**Inner Glove Removal**

Remove inner gloves and deposit them in the appropriate container for disposal.



**Field Wash**

Thoroughly wash hands and face with soap and water. Shower as soon as possible.

**LEVEL C DECONTAMINATION FOR  
RESPIRATOR-CARTRIDGE EXCHANGE****Equipment Drop**

Deposit equipment used on site (tools, sampling devices, monitoring equipment, radios, etc.) on plastic drop cloths. Decontaminate or dispose of items before removal from exclusion zone.

**Outer Boot/Glove Wash and Rinse**

Scrub outer boots/gloves and/or splash suit with decontamination solution then rinse with water.

**Outer Boot/Glove Removal**

Remove outer boots/gloves:

- If outer boots/gloves are disposable, deposit them in the appropriate plastic-lined container.
- If outer boots/gloves are not disposable, store them in a clean, dry place.

**Respirator Cartridge Change**

Exchange respirator cartridges. Don new outer boots/gloves. Tape joints and return to exclusion zone.

**LEVEL D-MODIFIED ROUTINE DECONTAMINATION****Equipment Drop**

Deposit equipment used on site (tools, sampling devices, monitoring equipment, radios, etc.) on plastic drop cloths. Decontaminate or dispose of items before removal from exclusion zone.

**Outer Boot/Glove Wash and Rinse**

(Optional, include if necessary for gross decontamination)

Scrub outer boots/gloves and/or splash suit with decontamination solution then rinse with water.

**Outer Boot/Glove Removal**

Remove outer boots/gloves:

- If outer boots/gloves are disposable, deposit them in the appropriate plastic-lined container.
- If outer boots/gloves are not disposable, store them in a clean, dry place.

**Outer Garment Removal**

Remove chemical protective outer garments and deposit them in an appropriate container. Remove hard hat and safety glasses. Decontaminate them as necessary and deposit on a clean surface.

**Inner Glove Removal**

Remove inner gloves and deposit them in the appropriate container for disposal.

**Field Wash**

Thoroughly wash hands and face with soap and water. Shower as soon as possible.

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H



H

FIELD EMERGENCY  
RESPONSE PROCEDURES

# H

## FIELD EMERGENCY RESPONSE PROCEDURES

Based on the type of potential hazards that may be present, the Site Safety Officer (SSO) is to determine if a site specific emergency response plan is necessary prior to the beginning of work. If a site specific plan is necessary, it is to be attached to the Site Safety Plan (SSP).

### FIRES AND EXPLOSIONS

Even a minor fire can become a serious problem, particularly when adjacent to flammable or combustible materials. The first few minutes after discovery of a fire are the most critical in preventing a larger emergency.

In case of a fire or explosion, immediately turn off burners and other heating devices and stop any work in progress. Give priority to assisting injured persons.

#### **Small Fires**

Take the following actions immediately:

- Alert other personnel in the vicinity and send someone for assistance
- If it is a small fire - one that can be extinguished within 30 seconds or with one fire extinguisher - attempt to extinguish the blaze if:
  - Conditions are safe
  - You have the proper type of fire extinguisher
  - You have been trained to use a fire extinguisher properly
  - You are not alone

The combination (ABC) extinguishers in the MW Emergency Kits can be used against the following classes of fires:

- Class A fires - ordinary combustible solids such as paper, wood, coal, rubber and textiles
- Class B fires - petroleum hydrocarbons (diesel fuel, motor oil and grease) and volatile flammable solvents
- Class C fires - electrical equipment

These extinguishers, however, are not effective against Class D fires which include combustible or reactive metals (such as sodium and potassium), metal hydrides or organometallics. Special Class D extinguishers are required.

Avoid entrapment by a fire; always fight from a position accessible to an exit.

If there is any chance that the fire can not be controlled by locally available personnel and equipment, the following action should then be taken:

- Activate the emergency alarm system (if available) and notify the local fire department.
- Confine the emergency to prevent further spread of the fire.
- Assist injured personnel and provide first aid or transportation to medical aid, if necessary.

Next notify client if the client is in close proximity to the fire. (If not, notify the fire department). Assess the need with the client to contact the fire department. If the fire department is contacted, be prepared to tell them:

- Who you are
- Your location
- Type of fire (i.e., electrical, chemical, combustible solids, vapor)
- If the fire is extinguished
- The need for medical assistance
- Other potential hazards in the area (i.e., proximity to bulk tanks, downed electrical lines, poor access)
- What you will be doing after you hang up the phone and where they can find you or reach you

Upon arrival of the local fire department, brief them of the incident. When given permission, contact the Project Manager (PM) or in the PM's absence, the Office Supervisor or Corporate Health and Safety Manager.

### **Large Fire or Explosion**

If other people are in the area, immediately notify them and then call the local fire department. Be prepared to tell them:

- Who you are
- Your location
- Type of fire (i.e., electrical, chemical, combustible solids, vapor)
- If the fire is extinguished
- The need for medical assistance
- Other potential hazards in the area (i.e., proximity to bulk tanks, downed electrical lines, poor access)
- What you will be doing after you hang up the phone and where they can find you or reach you

Upon arrival of the fire department, turn over command to them and supply as much information as possible. When given permission, contact the PM or in the PM's absence, the Office Supervisor or Corporate Health and Safety Manager. Get a number where they can again be reached.

## **FLAMMABLE/COMBUSTIBLE LIQUID SPILLS**

If a spill of a flammable or combustible liquid occurs, all possible sources of ignition should be extinguished or removed immediately.

Use Material Safety Data Sheets (MSDSs), analytical information from laboratory personnel, and any other available sources of information, together with your own expertise to determine if spill control and clean up can be safely accomplished with the personnel and materials on site.

The following general spill clean up procedures can be utilized, but more specific techniques might be required for certain chemicals.

- Vermiculite or other suitable absorbent may be used to solidify free liquids.
- Both spilled liquids and solids residues must be contained in drums.

- If a spill occurs on soil, it must be scraped and contained.

## **EVACUATION**

Prior to beginning work, the SSO should brief all MW and subcontractor employees on what the evacuation signal should be. It may be nothing more than a verbal command or it may be some audible alarm such as a bell or horn. If working at a client's site, familiarize yourself with their warning system.

Prior to work, the SSO should determine a meeting place if evacuation is necessary. Preferably the meeting place should be upwind of the work activities and at a safe distance. All MW and subcontractor employees should be informed of the meeting location.

If evacuation is necessary, everyone should go directly to the meeting area. The SSO should ensure all personnel (MW and subcontractor) are accounted for. This will mean checking the sign-off documentation on the Site Safety Plan or on larger jobs the daily sign-in roster. The local on-scene commander should immediately be notified of any missing personnel as well as their last known whereabouts.

### **Site Evacuation**

If an evacuation of the site is necessary, certain rules must be strictly followed:

- Employees in the vicinity should immediately shut down all equipment and disconnect electrical or flammable power sources to machinery.
- Immediately after personnel are alerted, they will evacuate the facility via the nearest escape route.
- All evacuated personnel will assemble at the predetermined meeting place.
- Employees should not wait for friends; the Site Safety Officer will ensure all personnel have evacuated before departing.
- Employees should move quickly and calmly without panic.
- Employees should not smoke.
- Once assembled, employees should remain calm and quiet while the Site Safety Officer takes roll call and assesses the situation. Each employee must report to the Site Safety Officer until everyone is accounted for and evacuation is complete.



### **Off-Site Evacuation**

If an incident is large enough, off-site personnel may also need evacuation. If off-site evacuation is necessary, follow the appropriate local notification procedures, generally through the fire department. MW personnel should not attempt to evacuate off-site personnel but should leave that task to the local authorities. All MW employees should follow the evacuation directions given by the local authorities. The Site Safety Officer should offer to remain at the command post to supply information. If told to leave, the SSO should leave.

Local authorities will have present an on-scene commander. The on-scene commander will direct emergency operations and will have assistance from the local fire department, police department and emergency government.

After evacuating to a safe area, the PM should be contacted or in the PM's absence, the Office Supervisor or Corporate Health and Safety Manager.

## **DISCUSSION OF INCIDENT**

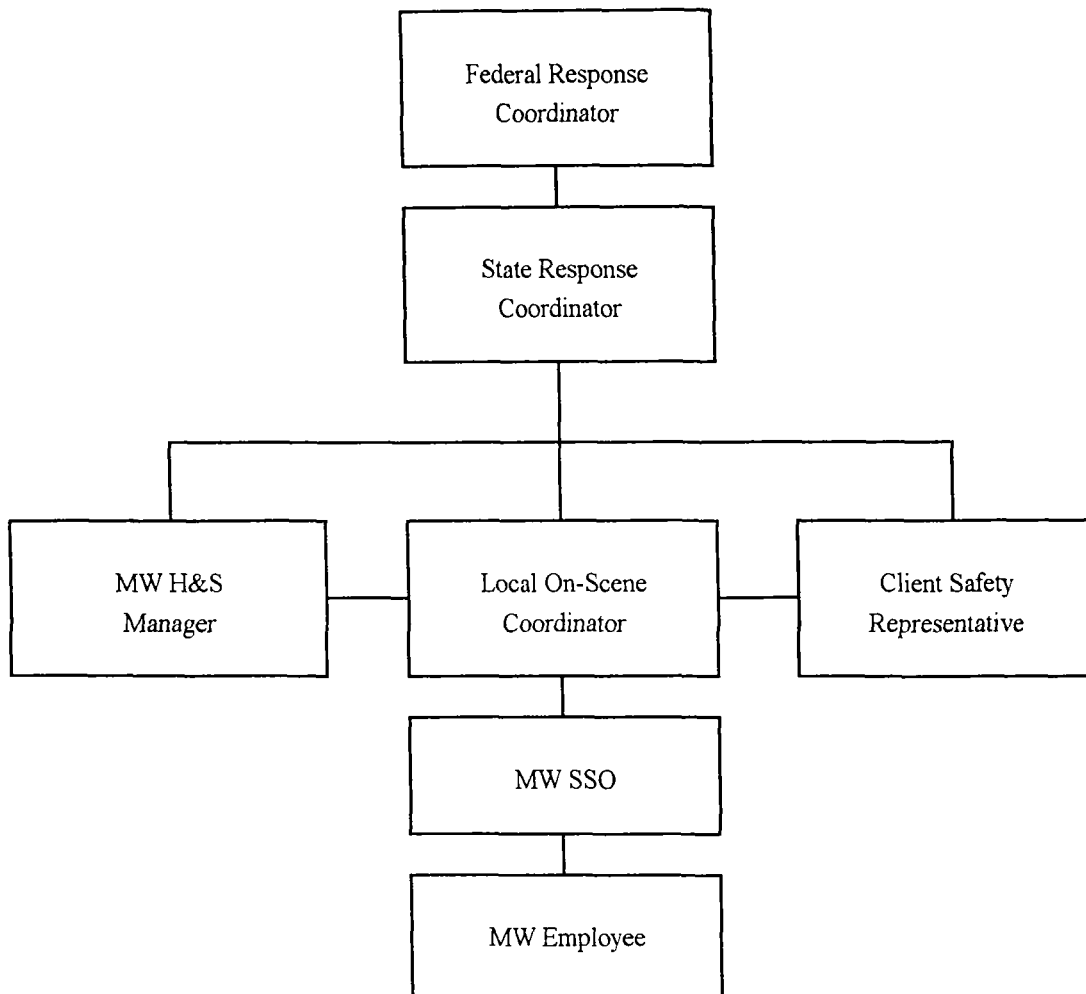
At no time should a MW employee discuss an emergency incident with members of the media. Politely refuse to discuss the situation and instead, direct all inquiries to the Corporate Health and Safety Manager. Provide the media people with the office phone number.

However, MW employees should always provide whatever useful information they can to response personnel. Stick to helpful facts and avoid placing blame or judgement. That will be sorted out later. Politely refuse to find fault or place blame.

At a safe place and at the appropriate time, write down all you remember of the incident. How did it happen? Who was doing what? What did I see? What did I hear? All these types of things may be important later when things are sorted out.

## **CHAIN-OF-COMMAND**

The number of people involved in an incident will be directly related to the severity of the incident. In the event of an incident, the chain-of-command could be as extensive as:



Upon arrival of the local on-scene coordinator or client safety representative, the MW SSO should turn over command of the situation. The responsibility of the MW SSO is then to supply information and offer MW supplies and personnel if requested. It is likely the local on-scene coordinator or client safety representative will not request MW personnel but may request MW supplies (HNu, absorbent, drums). In a major incident, it is likely the MW Health and Safety Manager will arrive at the scene. At that time, all responsibilities of the SSO should be turned over to the Health and Safety Manager.

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I

FIRST AID

# I

## FIRST AID

### OPEN WOUNDS

Stop the bleeding by direct pressure, elevation, and if necessary, direct pressure on the supply artery. Do not attempt to cleanse severe wounds. Apply a sterile dry dressing to protect the wound from contamination. Provide shock care. Obtain medical attention.

### MINOR BURNS

The object of first aid for burns is to relieve pain, prevent contamination, and prevent shock. First degree and second degree burns should be submerged in cold water until the pain subsides. Gently blot dry then apply a sterile dry dressing as a protective bandage. Do not break blisters, or remove any tissue. Do not use an antiseptic preparation, ointment or spray. Seek medical attention immediately if burns are severe.

### EYE INJURIES

Foreign objects are often blown or rubbed into the eyes. Keep victim from rubbing eye. Wash hands before examining eye. Do not attempt to remove foreign objects by inserting toothpicks, or other instruments. If object is embedded in eye, seek medical attention immediately. If object is not embedded try to remove by teardrops, or flushing with water. If object is not easily removed, seek medical attention.

Contusions may be caused by direct blow or explosion. Stop hemorrhage by gently applying direct pressure, then protect eye from contamination with a dry sterile dressing. Seek medical attention immediately.

## **GENERAL SEQUENCE FOR TREATMENT OF EXPOSURES TO UNKNOWN CHEMICALS**

1. Quickly protect yourself from exposure before attempting to rescue the victim.
2. Decontaminate the victim and terminate exposure.
3. Treat cessation of breathing first.
4. If the heart is not beating, perform cardiopulmonary resuscitation (CPR).
5. Treat eye injuries next.
6. Treat skin contact.
7. Treat shock.
8. Call for help.

### **PRELIMINARY ASSESSMENT**

Make a quick assessment of the likely routes of exposure by examining the eyes, mouth, nose and skin of the victim for signs of the chemical itself or damage it has caused such as swelling, redness, bleeding, burns, discharge of fluid or mucous or pallor.

Drooling, difficult swallowing, a distended and painful or hard, rigid abdomen all indicate possible ingestion of a corrosive or caustic substance.

If respirations are rapid, shallow, noisy or labored, suspect inhalation.

If the face has been splashed with chemical, eye contact is likely.

### **POISONING BY INHALATION**

Remove the victim from exposure while protecting yourself from exposure.

If breathing has stopped, administer artificial resuscitation using a disposable resuscitator and avoid mouth-to-mouth contact. **DO NOT** use mouth-to-mouth resuscitation if the nature of the chemical exposure is unknown.

Maintain an open airway.

Notify an emergency medical service of the nature of the accident and arrange for transport to a medical facility.

### **POISONING BY INGESTION**

Remove the victim from exposure while protecting yourself from exposure.

Call a poison control center, emergency room or physician for advice.

Notify an emergency medical service of the nature of the accident and arrange for transport to a medical facility.

Consult the MSDS to determine whether to offer victim water to drink or to induce vomiting and by what means.

If the victim is conscious:

- Have the victim rinse out mouth with water.
- If there are no signs of burns, swallowing difficulty or abdominal problems and victim is conscious and if so advised by a physician or poison control center:
  - Induce vomiting by giving two teaspoons of Syrup of Ipecac. Follow with at least one cup of water. **DO NOT** use milk. If you do not have Syrup of Ipecac, induce vomiting by asking the victim to touch the back of the throat with a finger, spoon handle or blunt instrument.
  - Have the victim sit up or lean forward while vomiting.
  - Save any vomitus and give it to the emergency medical service personnel to take to the medical facility for analysis.
  - Give the victim one to two cups of water to drink after vomiting has ceased.
- Keep talking to the victim to prevent sleepiness.

If the victim is unconscious:

- Lay the victim on the victim's left side, bending the victim's right hip.
- Maintain an open airway.
- Arrange for transport to the nearest medical facility.

- Stand by to administer artificial resuscitation and CPR if needed. Be sure to wipe or rinse all traces of chemical from in and around the victim's mouth before giving artificial resuscitation. Always use disposable resuscitators supplied in the MW First Aid kits when performing CPR. **DO NOT** use mouth-to-mouth resuscitation if the nature of the chemical exposure is unknown.
- If breathing has stopped, administer artificial resuscitation using a disposable resuscitator and avoid mouth-to-mouth contact.

If the victim vomits, save the vomitus and send it to the medical facility for analysis.

If the victim shows signs of shock (a weak, rapid pulse; pale clammy skin; cold hands and feet), elevate the victim's feet eight to twelve inches and cover the victim with a blanket.

**DO NOT** give an unconscious person anything to drink.

**DO NOT** give someone who is convulsing anything to drink.

### **POISONING BY SKIN CONTACT**

Remove the victim from the contaminated area, being careful to protect your lungs, skin and eyes.

Remove the victim's clothing, shoes and jewelry from the affected areas, cutting them off if necessary. Do this under a shower or while flushing with water.

Continue to flush with water until all trace of the chemical is gone and any slippery feeling has disappeared also. Rinse for at least 15 minutes.

Cover the victim with a blanket or dry clothing.

Notify a physician, emergency room or poison control center of the accident and obtain advice.

In case of inflammation, burns, blisters or pain:

- Loosely apply a dry sterile dressing, if available, or use a clean dry cloth.
- Notify an emergency medical service of the nature of the accident and arrange for transport to a medical facility.



- If the victim is in a state of shock:
  - Lay the victim down on the victim's side and cover the victim with a blanket.
  - Elevate the victim's feet eight to twelve inches.
  - Notify an emergency medical service of the nature of the accident and arrange for transport to a medical facility.

**DO NOT** break open blisters or remove skin. If clothing is stuck to the skin after flushing with water, do not remove it.

**DO NOT** rub or apply pressure to the affected area.

**DO NOT** apply any oily substance to the affected skin.

**DO NOT** use hot water.

### **POISONING BY EYE CONTACT**

Remove the victim from the contaminated area, being careful to protect your lungs, skin and eyes.

Act quickly. Seconds count. Flush the victim's eye(s) with clean tepid water for at least 15 minutes. Have the victim lie or sit down and tilt head back. Hold eyelid(s) open and pour water slowly over the eyeball(s) starting at the inner corners by the nose and letting the water run out of the outer corners. The victim may be in great pain and want to keep eyes closed or rub them but you must rinse the chemical out of the eye(s) in order to prevent possible permanent damage.

Ask the victim to look up, down and side to side as you rinse.

Call an emergency medical service and arrange for transport to the nearest facility for examination and treatment as soon as possible. Even if there is no pain and vision is good, a physician should examine the eye(s) since delayed damage may occur.

If the eye(s) is(are) painful:

- Cover loosely with gauze or a clean, dry cloth
- Maintain verbal and physical contact with the victim

## **HYDROGEN CYANIDE EXPOSURE**

Hydrogen cyanide is a Class A poison which can cause asphyxiation by ingestion, inhalation, or absorption of liquid or vapor through the skin (particularly eyes, mucous membranes, and feet). Hydrogen cyanide has a bitter almond odor and has a threshold limit value-ceiling-TLV-C of 4.7 ppm.

The SSO will notify the local medical facility if the potential for hydrogen cyanide exposure exists at the Site. This will allow emergency personnel to have the necessary equipment in the event of a cyanide exposure emergency.

### **Signs and Symptoms of Exposure**

#### **Inhalation**

Very acute poisoning

- Victim cries out before losing consciousness
- Victim falls to the ground
- Wheezing
- Foaming at mouth
- Violent convulsions
- Almost immediate death

Acute poisoning

- Excitement phase
  - Headache
  - Breath smells of bitter almond
  - Dizziness
  - Nausea, occasionally vomiting
  - Rapid breathing
  - Anxiety and excitement
- Depression phase
  - Difficulty in breathing
  - Chest pain
  - Drowsiness
- Convulsion phase
  - Convulsions
  - Jaws clenched together
  - Foaming at mouth
  - Loss of consciousness

- Paralysis phase: If the subject survives, there is a risk of permanent nervous system damage.
  - Deep coma
  - Dilated pupils
  - Weak and irregular pulse
  - Breathing stops
  - Death

#### Slight poisoning

- Headache
- Dizziness
- Anxiety
- Difficulty in breathing

#### Ingestion

(See symptoms described under Inhalation - Acute to slight poisoning)

Burning tongue and mouth

Salivation

Nausea

#### Skin contact

The gaseous and liquid compounds are quickly absorbed by the skin and cause symptoms described under INHALATION, resulting in acute to slight poisoning. Depending on their nature, they can be very or only slightly irritating.

#### Splashing in eyes

Irritation and watering of eyes

When absorbed by mucous membranes of the eyes, these compounds can cause the same symptoms described in INHALATION, resulting in slight poisoning.

#### **First Aid**

##### Inhalation

Remove the victim from the contaminated area only after protecting yourself from exposure.

Have someone call the Emergency Medical Service and arrange for transport to a medical facility. Inform them of the nature of the exposure.

Remove contaminated clothing and equipment while wearing appropriate protective clothing.

If the victim has stopped breathing:

- Open airway, loosen collar and belt. Do not use direct mouth-to-mouth resuscitation for cyanide exposure. A bag-valve mask is required.
- Check the pulse.
- Continue your efforts until help arrives or the victim starts to breathe on their own.
- Keep the victim warm and quiet.

If the victim is unconscious but breathing:

- Lay the victim on their back. If the victim is vomiting, turn the head to the side.
- Clear the airway and loosen tight clothing.
- Keep victim warm and quiet.
- Do not leave the victim unattended.
- Never give an unconscious person anything to drink.

If the victim is conscious:

- Lay the victim down, cover the victim with a blanket and keep them quiet.
- Loosen tight clothing.

#### Ingestion

Start lifesaving treatment, call for help and, if possible, empty the stomach and prevent further injury caused by absorption. PROMPT TREATMENT IS LIFESAVING.

- Ask someone to call a poison control center, inform them of the chemical swallowed and follow their advice.
- Ask someone to call the Emergency Medical Service and arrange for transport to a medical facility.

If the victim is unconscious or unresponsive:

- Lay the victim on the left side and loosen the victim's collar and belt.
- Check the airway for obstruction.

If the victim stops breathing, administer artificial respiration using a bag-valve mask. Do not use direct mouth-to-mouth resuscitation.

If the victim is conscious and alert:

- Remove the victim from the contaminated area to a quiet, well ventilated area.
- Loosen tight clothing around the neck and waist.
- Have the victim rinse mouth several times with cold water and spit out.
- Give him 1 or 2 cups of water or milk to drink.
- Induce vomiting by touching the back of the throat with your finger, a spoon handle or a blunt object.
- Have the victim sit up and lean forward while vomiting.
- Save vomitus for analysis later. Avoid skin contact with it.
- Do not leave the victim alone.

**DO NOT** give an unconscious person or a person who is having a convulsion anything to drink. **DO NOT** give alcohol, drugs, or stimulants like tea or coffee. **DO NOT** continue to try to induce vomiting in someone who doesn't gag when you touch the back of his throat.

#### Skin contact

Remove the victim from the source of contamination and take them **IMMEDIATELY** to the nearest shower or source of clean water. Remove clothing, shoes, socks and jewelry from the affected areas as quickly as possible, cutting them off if necessary. Be careful not to get any of the chemical on your skin or clothing. Wash the affected area under tepid running water using a mild soap. Thoroughly rinse the affected area with tepid water. Dry the skin gently with a clean, soft towel. Notify a physician, emergency room, or poison control center and inform them of the nature of the substance and the accident. Arrange for transport to the nearest medical facility. Do not leave the victim alone. Watch for signs of systemic toxicity.

If the skin is inflamed or painful, put the painful part in cold water or apply cold wet dressings on the burned area.

#### Eye contact

Remove all the chemical from the eye(s) quickly. Remove the victim from the source of contamination and take them to the nearest eye wash, shower, or other source of clean water. Gently rinse the affected eye(s) with clean, lukewarm

water for at least 15 minutes. Have the victim lie or sit down and tilt their head back. Hold the eyelid(s) open and pour water slowly over the eyeball(s) at the inner corners, letting the water run out the outer corners. Ask the victim to look up, down and side to side as you rinse in order to better reach all parts of the eye(s). Have the victim remove contact lenses if they are wearing them. Arrange for transport to the nearest medical facility for examination and treatment by a physician as soon as possible. Tell the Emergency Medical Service personnel the name of the chemical and the nature of the accident. Even if there is no pain and vision is good, a physician should still examine the eye(s) since delayed damage may occur. If the victim cannot tolerate light, protect the eye(s) with a clean, loosely tied handkerchief or strip of clean, soft cloth or bandage. Be sure to maintain verbal communication and physical contact with the victim.

**DO NOT** let the victim rub eye(s). **DO NOT** let the victim keep eyes tightly shut. **DO NOT** introduce oil or ointment into the eye(s) without medical advice. **DO NOT** use hot water.

In all instances when performing First Aid procedures personnel should follow guidelines for Bloodborne Pathogens. Use the PPE - gloves, disposable mouth-to-mouth resuscitators, safety goggles and overgarments supplied in MW First Aid kits. Report all First Aid incidents to the Health and Safety Manager immediately.

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